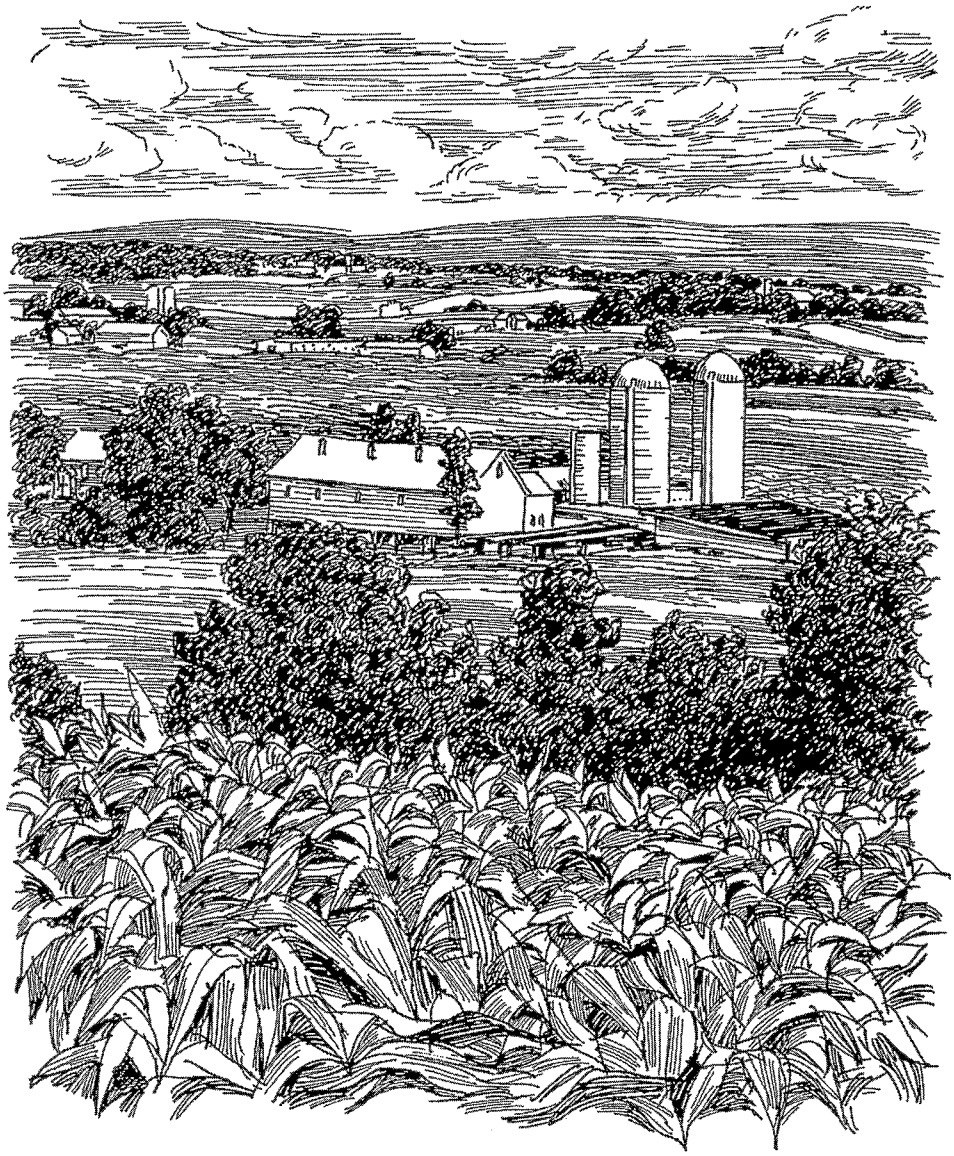
Agronomic Crops Team On-Farm Research Projects 2002



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May 2003
Special Circular 190
Ohio Agricultural Research and Development Center
In Partnership With Ohio State University Extension,
the Agricultural Industry, and Farmers

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Agronomic Crops Team On-Farm Research Projects 2002

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The Ohio State University
Ohio Agricultural Research and Development Center
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Introduction

This booklet contains the on-farm research results of Extension agents, specialists, and associates affiliated with the Ohio State University Extension Agronomic Crops Team. Results are primarily from experiments conducted during 2002.

All research trials in the report used at least three replications of the treatments compared. Many of the results reported are based on a single year of data. For the producers who collaborated in these trials and those who read these results, major production changes should not be based on one year of information. This information is published to stimulate discussion and to encourage further testing on individual farms.

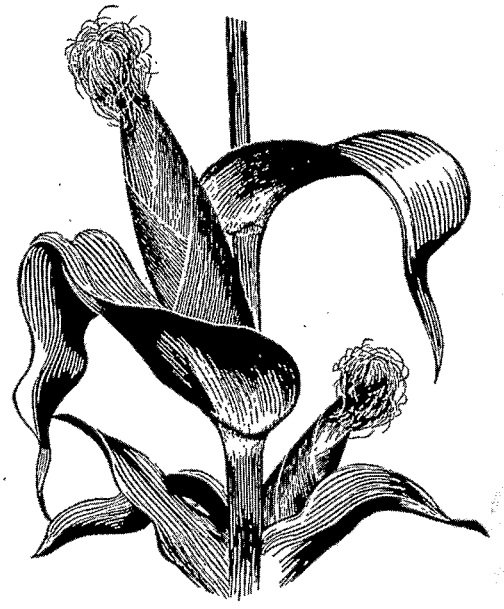
We hope that the publishing of these applied research reports will enhance the Agronomic Crops Team's efforts in meeting the needs of Ohio farmers and the state's agricultural industry. We would also like to express our appreciation to all the Ohio producers who participated in these trials.

Acknowledgments

I would like to thank the Ohio State University faculty and staff who assisted in the review and editing of these reports, especially Ed Lentz, district agronomy specialist; Steve Bartels, Jim Beuerlein, Bruce Clevenger, Bruce Eisley, Mike Estadt, Mike Haubner, Rafiq Islam, Jim Jasinski, Andy Kleinschmidt, Greg LaBarge, Ed Lentz, Pat Lipps, Mark Loux, Dave Marrison, Jeff McCutcheon, Dennis Mills, Gary Prill, Steve Prochaska, Randall Reeder, Steve Ruhl, Steve St. Martin, Howard Siegrist, John Smith, Jeff Stachler, Alan Sundermeier, Peter Thomison, Barry Ward, and Maurice Watson.

— Phil E. Rzewnicki, On-Farm Research Coordinator and Editor

Corn Management



Effect of Soil Insecticide on Yields of First-Year Corn

Steve D. Ruhl, Agriculture and Natural Resources Extension Agent

Objective

To evaluate the effect of soil insecticide on population and yield of first-year corn.

Background

Cooperator:	Tom Weiler	Fertilizer:	246 lb/A N, 114 lb/A P_2O_5, 120 lb/A K_2O
County:	Morrow		
Nearest town:	Chesterville	Herbicide:	PRE: 2 lb/A Atrazine
Drainage:	Systematically tiled		1.3 pt/A Dual II Magnum
Soil Type:	Sloan silty clay loam		2 oz/A Balance Pro
Tillage:	Conventional		POST: Distinct 4 oz/A
Previous Crop:	Soybeans	Planting Date:	May 20
Variety:	Pioneer 34M94	Planting Rate:	40,000 seeds/A
Soil Test:	pH 6.0, P 49 ppm, K 253 ppm	Row Width:	30-inch
		Harvest Date:	October 22

Methods

The study was a split-planter design. Three rows of the six-row planter had Counter insecticide added. The rate used was 6 oz/1,000 foot of row. The treatments were six-rows wide and 600-feet long. The entire plot was harvested and weighed using a weigh wagon. The treatments were replicated six times.

Results

Table 1. Corn Yields.

Treatment	Yield (bu/A)
Counter	191.9
No Counter	195.8
LSD (0.05)	NS
F test	<1

Summary

Prior trapping at this location for biotype corn rootworm beetles has suggested that rootworms should be no problem on corn following soybeans in this field. Past studies conducted using insecticide on first-year corn have shown increased yields but seldom enough to cover the costs for the insecticide used.

The results obtained this year actually showed no difference in yield when corn insecticide was used at planting. The insecticide added to the cost of production and decreased the profit per acre.

Acknowledgment

The author would like to thank Pioneer for providing the seed and Tom Weiler for being the cooperator for this study.

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Effect of T-22 Biological Fungicide Treatment on Two Soil Management Systems

Steve D. Ruhl, Agriculture and Natural Resources Extension Agent

Objective

To evaluate the effect of T-22 biological fungicide seed treatment on corn yields on two different soil management systems.

Background

Cooperator:	Tom Weiler	Fertilizer:	N (see Tables), 114 lb/A P_2O_5, 120 lb/A K_2O
County:	Morrow		
Nearest town:	Chesterville	Herbicide:	PRE 2 lb/A Atrazine, 1.5 pt/A Dual, 2 oz/A Balance Pro
Drainage:	Systematically tiled		
Soil Type:	See Tables		
Tillage:	Conventional till	Row Width:	30-inch
Previous Crop:	Soybeans	Planting Date:	May 20, 2002
Soil Test:	pH 6.0, P 49 ppm, K 253 ppm	Planting Rate:	40,000 seeds/A
		Harvest Date:	October 22, 2002

Methods

The study was set up as a split-planter design. Three units of the six-row planter had T-22 applied to them. The treatments were six rows wide and approximately 600 feet long. The entire plot area was harvested and weighed using a weigh wagon. The amount of T-22 used was 3 ounces per 100 pounds of seed. Five replications were used in this study.

Results

Table 1. Corn Yield on Sloan Silty Clay Loam and 246 lb/A N as Anhydrous Ammonia.

Treatment	Yield (bu/A)
T-22	159.2 a
No T-22	175.4 b
LSD (0.05)	7.1
F test	34.3

Table 2. Corn Yield on Chili Loam and 172 lb/A N as Anhydrous Ammonia.

Treatment	Yield (bu/A)
T-22	52.8 a
No T-22	59.8 b
LSD (0.05)	3.4
F test	32.2

Summary

T-22, produced by BioWorks, Inc., is a biological fungicide that is applied as a dry powder to seeds in the planter box. The rate used is 3 ounces per 100 pounds of seed. T-22 is promoted to protect roots from soil-borne pathogens such as Pythium, Fusarium, and Rhizoctonia. Healthier roots are thought to better utilize nitrogen and withstand drought.

The 2002 growing season was very dry. These plots received a total of 1.1 inches of rain in July and 2.0 inches in June. The results obtained this year do not support the improvement in yield with the use of T-22 as found in a similar study in 2001. The 2002 growing season included excessive soil moisture at planting, soil compaction, high temperatures, flea beetles, and drought-caused stresses that can undermine the value of test plot data. More studies with T-22 need to be completed.

Acknowledgment

The author would like to thank LG Seeds and Golden Harvest for donating the seed and Mark Matthews (Advanced Biological Marketing) for donating the T-22 fungicide. Also, thanks are extended to the cooperator, Tom Weiler.

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Effect of Gaucho (Imidacloprid) Seed Treatment on Corn Yield

Steve D. Ruhl, Agriculture and Natural Resources Extension Agent

Objective

To evaluate the effect of Gaucho seed treatment on corn yield.

Background

Cooperator:	Tom Weiler	Fertilizer:	170 lb/A N, 27 lb/A P_2O_5, 125 lb/A K_20
County:	Morrow		
Nearest town:	Chesterville	Herbicide:	PRE: 1.5 pt/A Dual II Magnum, 2 lb/A Atrazine, 2 oz/A Balance Pro POST: 4 oz/A Distinct
Drainage:	Naturally well-drained		
Soil type:	Chili loam		
Tillage:	Conventional		
Previous Crop:	Soybeans	Row Width:	30-inch
Variety:	See below	Planting Date:	May 16
Soil Test:	pH 6.3, P 36 ppm, K 159 ppm	Planting Rate:	30,100 seeds/A
		Harvest Date:	October 22

Methods

Gaucho treated seeds from each corn hybrid, Vigoro V5110 and Golden Harvest 8770, were compared with untreated seeds of the same hybrid. A split-planter design was used. Each treatment strip was six-rows wide and 500 feet long (0.17 A), replicated six times. The entire area was harvested and weighed with a weigh wagon.

Results

Table 1. Corn Yields With and Without Seed Treatment.[a]

Treatment	Hybrid	Yield (bu/A)	Yield (bu/A)
Gauch	Vigoro V5110	49.0 b	
No Gaucho	Vigoro V5110	53.2 a	
Gaucho	Golden Harvest 8770		62.0 b
No Gaucho	Golden Harvest 8770		75.8 a
	LSD (0.05)	3.8	11.5
	F-test	9.4	11.0

[a] Means in same column followed by the same letter are not significantly different.

Summary

While monitoring the plots throughout the spring and summer, it was observed that the Gaucho-treated rows appeared greener and healthier compared to the untreated rows. When the plots were harvested on October 22, yields in the Gaucho-treated plots were significantly lower than the untreated plots (Table 1). Due to droughty conditions, the 2002 crop year may not have been a very good growing season to evaluate the use of seed treatments. We will try to evaluate the use of Gaucho-treated seed corn in the future when more normal growing conditions prevail.

Acknowledgment

The author would like to thank Royster Clark and Golden Harvest for providing the seed used in the study. A special thanks is extended to the cooperator, Tom Weiler.

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Nontraditional Fertilization of Corn at Planting

Steve Bartels, Agriculture and Natural Resources Extension Agent

Objective

To evaluate several combinations of starter fertilizer and sidedress nitrogen applications for their effects on corn stand and yield.

Background

Cooperator:	Stephen Janos	Soil test:	pH 6.4, P 13 ppm, K 157 ppm
County:	Butler		
Township:	Fairfield	Fertilizer:	See Methods below
Drainage:	Moderately well to somewhat poorly drained	Herbicides:	Harness Extra 2 qt/A, Hornet 4 oz/A, Attrex90 1.5 lb/A, Accent 2/3 oz/A
Soil type:	Fincastle, Dana, and Raub silt loams	Planting Date:	May 23, 2002
Tillage:	No till	Planting Rate:	28,200 seeds/A
Previous crop:	Soybeans	Row Width:	30-inch
Variety:	Fielders Choice 8412	Harvest Date:	October 22, 2002

Methods

The trial was established as a completely randomized design with six treatments replicated four times. The six treatments were as follows:

1. 45 gallons 28% N solution sidedressed (135 lb/A N). Cost = $22.50.

2. 5 gallons 8-19-3 (4.0-9.5-1.5 lb/A of N-P_2O_5-K_2O) applied on seed at planting and 43 gallons 28% N solution (130 lb/A of N) sidedressed. Cost = $36.50.

3. 5 gallons 8-19-3 applied on seed at planting and 25 gallons 28% N solution (75 lb/A of N) placed 4 inches to side and 2 inches below the seed followed by 18 gallons 28% N solution (55 lb/A of N) sidedressed. Cost = $36.50.

4. 5 gallons 8-19-3 applied on seed at planting plus 25 gallons 28% N solution and 5 gallons 12-0-0-26 (6 lb/A of N and 13 lb/A of S) placed 4 inches to side and 2 inches below the seed. This was followed by 16.5 gallons 28% N solution (50 lb/A of N) sidedressed. Cost = $44.50.

5. 25 gallons 28% N solution placed 4 inches to side and 2 inches below the seed followed by 20 gallons 28% N solution (60 lb/A of N) sidedressed. Cost = $22.50.

6. 25 gallons 28% N solution and 5 gallons 12-0-0-26 placed 4 inches to side and 2 inches below the seed followed by 18 gallons 28% N solution sidedressed. Cost = $30.50.

Individual treatment plots were 20 feet wide and 440 feet long. Measures of performance to be compared were the number of corn plants that emerged five weeks after planting and corn yields at harvest. The stand counts were evaluated by counting plants in 1/196 of an acre in three locations within each 0.2-acre plot. The yield was determined by weighing the corn from each plot at harvest and adjusting to 14.5 percent moisture.

Results

Table 1. Corn Plant Population and Yield.

Treatment Number	Emerged Plant Population (plants/A)	Yield (bu/A)
1	26,750	38.1
2	27,166	41.9
3	26,083	28.8
4	26,417	50.6
5	24,750	37.7
6	27,333	46.6
Critical value[a]	NS	NS
F test	1.9	1.1

[a] Tukey comparison of means used for large number of comparisons.

Summary

There were no significant differences in emerged corn plant populations among the six fertilizer treatments. Yields were affected by drought conditions during the growing season. Significant differences were not found among the six fertilizer treatments.

Acknowledgments

The author wishes to thank Adam Smith, Pioneer Seeds, for his help in harvesting the plots; Kevin Fall, OSU Extension Summer Intern; and Stephan Janos for their cooperation.

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Value of Pop Up Fertilizer on Corn — 1

Steve Bartels, Agriculture and Natural Resources Extension Agent, Butler County, Ohio

Objective

To evaluate the benefits of applying 9-19-9 fertilizer directly to the seeds as a pop-up fertilization program in corn. This was measured by comparison of initial stand and yield at harvest.

Background

Cooperator:	Gerber Farms	Soil test:	pH 6.5, P 96ppm, K 122 ppm, CEC 11 meq/100g
County:	Butler		
Township:	Wayne	Fertilizer:	See Methods
Drainage:	Somewhat poorly drained	Planting date:	May 25, 2002
Soil type:	Raub silt loam, Fincastle silt loam	Planting Rate:	33,000 seeds/A Row width: 30 inch
Tillage:	Reduced till	Herbicide:	Bicep II Magnum 1 qt/A
Previous crop:	Soybeans		AAtrex 90 1 lb/A
Variety:	Golden Harvest 2495	Harvest date:	October 17, 2002

Methods

Plots either received pop up application of 4 gallons of 9-19-9 (3.5-7.5-3.5 lb/A) applied directly on the seed or they received no starter fertilizer. All plots also received 150 lb/A of 21-0-0 and 150 lb/A of 0-0-60 broadcast in the fall. All plots also received 185-lb/A anhydrous ammonia preplant.

The stand counts were evaluated by counting plants with in 1/196 of an acre in three locations within each plot. The yield was determined by weighing all the corn from each 0.742-acre plot and adjusting to 14.5% moisture. Each plot was 30 feet wide.

The experiment design is a completely randomized block design with four replications.

Results

Table 1. Corn Plant Population and Yield.

Treatment	Initial Population plants/A	Yield bu/A	Moisture %
No pop up	32,005	116.9	13.7
Pop up	32,250	120.4	13.9
LSD (0.05)	NS	NS	NS
F test	<1	<1	<1

Summary

The cost of the pop-up treatment was $9.00/acre. While there was a measured increase in initial stand and yield for the pop-up treatment vs. no fertilizer, the differences were not statistically significant. This year yields were lower than expected. We may see a difference between treatments in a normal or better yielding year.

Acknowledgments

The author wishes to thank Adam Smith, Pioneer Seeds, for his help in harvesting the plots; Kevin Fall, OSU Extension Summer Intern; and Gary Gerber for their cooperation. Special recognition to Phil Rzewnicki, OSU Extension, Program Specialist, Horticulture and Crop Science, for providing statistical analysis of the data.

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Value of Pop Up Fertilizer on Corn — 2

Steve Bartels, Agriculture and Natural Resources Extension Agent, Butler County, Ohio

Objective

To evaluate the benefits of applying 9-19-9 fertilizer directly to the seeds as a pop-up fertilization program in corn. This was measured by comparison of initial stand and yield at harvest.

Background

Cooperator:	David Hiltbrand	Soil test:	pH 7.0, P 99 ppm, K 244 ppm, CEC 19 meq/100g
County:	Butler		
Township:	St. Clair	Fertilizer:	See Methods
Drainage:	Moderately well drained	Planting Date:	May 28, 2002
Soil type:	Tippecanoe silt loam	Planting Rate:	27,700 seeds/A
Tillage:	Reduced till	Row width:	30 inch
Previous crop:	Wheat	Herbicide:	Bicep II Magnum 1 qt/A, AAtrex90 1 lb/A, Distinct 4 oz/A
Variety:	Pioneer 34M94		
		Harvest date:	October 3 and 4

Methods

Plots either received pop-up application of 5.5 gallons of 9-19-9 (4.5-10.5-4.5 lb/A) applied directly on the seed or they received no starter fertilizer. All plots received 185 lb/A of anhydrous ammonia.

The stand counts were evaluated by counting plants within 1/196 of an acre in three locations within each plot. The yield was determined by weighing all the corn from each 0.57 acre plot. Each plot was 30 feet wide.

The experiment design is a completely randomized block design with four replications.

Results

Table 1. Corn Plant Population and Yield.

Treatment	Initial Population	Yield	Moisture
	plants/A	bu/A	%
No pop up	26,166	92.0	16.4
Pop up	26,083	95.2	16.4
LSD (0.05)	NS	NS	NS
F test	<1	1.6	<1

Summary

The cost of the pop-up treatment was $13.20/A. While there was measured increase in yield for the pop-up treatment, the difference between the two treatments was not significant.

This year yields were lower than expected. We may see a difference between treatments in a normal or better yielding year.

The difference in stand also was not statistically significant. This is noteworthy since the pop-up programs sometimes reduce stands. The rates were within the guidelines of the Tri-State Fertilizer Recommendations (Extension Bulletin E-2567).

Acknowledgments

The author wishes to thank Adam Smith, Pioneer Seeds, for his help in harvesting the plots; Kevin Fall, OSU Extension Summer Intern; and David Hiltbrand for their cooperation. Special recognition to Phil Rzewnicki, OSU Extension, Program Specialist, Horticulture and Crop Science, for providing statistical analysis of the data.

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Effects of Spring and Fall Treatments of Surface-Applied vs. Incorporated Liquid Dairy Manure on Corn Yields, Nutrient Utilization, and Residue Cover in a No-Till System

Gary Graham, Northeast District Extension Specialist, Natural Resources
Ernest Oelker, Extension Agent, Ag. and Natural Resources, Columbiana County

Objective

The objective was two fold: (1) to gain an understanding of the nutrient value of land-applied liquid dairy manure when used with a nitrogen (N) stabilizer through two application methods and two application timings, and (2) to determine the impact of the application timings and methods on the percent residue cover of this no-till farming operation.

Background

Cooperators:	Myron Wehr and Scott Lindsay	Fertilizer:	Liquid dairy manure: 11,800 gal/A
County:	Columbiana	Planting Date:	May 6, 2002
Nearest Town:	New Waterford	Planting Rate:	34,200 seeds/A
Soil type:	Wooster silt loam, 0 to 5% slope	Row Width:	30-inch
Tillage:	No-till	Herbicides:	PRE: Balance Pro 1.9 oz/A, Leadoff 1 qt/A, Roundup 1 pt/A
Previous crop:	Double crop soybeans		
Variety:	Pioneer 34K77	Harvest Date:	October 21, 2002

Methods

Eight treatments were combinations of two application timings (fall and spring) of two application methods (surface applied and incorporated) using two manure types (manure with and without a nitrogen (N) stabilizer). These were compared with two fertilized controls (corn grown with a normal N package (120 lb N/A as 32% plus Zn and Ca) and the other with the normal N package containing the N stabilizer Guardian®). The 10 treatments were replicated four times in a randomized complete block design. Individual treatment plots were 30 feet wide and 500 feet long. The manure volume remained constant at 11,800 gal/acre, which was well within the standards set by the Natural Resource Conservation Service (NRCS) for the soil type, slope, etc., at the research site. A 10-foot AerWay® application toolbar pulled behind a 2,600 gal Husky® slurry tank was used to apply all manure.

Four pairs of comparisons, i.e., contrasts, were made to analyze the data collected in this trial: (1) surface applied vs. incorporated, (2) stabilizer present vs. no stabilizer, (3) manure vs. spring-liquid N, and (4) fall manure vs. spring manure.

Results

Monthly rainfall totals were May 3.95"; June 4.00"; July 0.6"; August 1.8"; September 0.9" for a season total of 11.25 inches. Nearly all the rain in May occurred between planting and emergence leading to heavy crusting of the disturbed soil in the newly incorporated plots. The plots then experienced a severe drought receiving only a small amount of rain from July through September.

Table 1. 2002 Corn Yields, Plant Populations, Soil Nitrate N, Plant Tissue N, and Compaction Changes by Treatment.

Treatment Code[a]	Corn Yield	Plant Pop. 5-30-02	Soil NO_3-N Change 10-11-01 to 11-15-02	Plant Tissue 8-06-02	Stalk N 10-26 2002	Soil Compaction Change at 0 - 8"	Soil Compaction Change at 8 - 14"	Soil Compaction Change at 14 -20"
	bu/A	#/A	ppm	%N	ppm	psi	psi	psi
SS	81.3	22,917	7.7	2.6	1,241	18.53	11.2	86.4
FS	77.9	26,583	-0.9	2.9	1,130	87.10	62.1	71.2
FS-G	77.3	28,833	1.1	2.9	1,961	26.04	20.6	83.4
SS-G	77.0	23,813	4.5	2.6	1,396	31.04	-38.6	-64.2
FI	76.4	28,250	4.4	2.7	2,068	-13.07	-15.1	-32.4
N-G	72.1	28,500	4.7	3.0	2,492	46.83	-14.5	-46.8
FI-G	72.1	28,250	11.0	3.1	2,256	-31.80	-10.8	37.6
N	67.0	28,250	9.7	2.7	2,542	20.23	33.5	17.5
SI-G	49.3	13,792	5.8	2.7	2,898	45.20	-35.2	62.5
SI	44.1	12,438	3.5	2.7	3,281	13.07	14.7	93.8

[a] Treatment code

FS = Fall, Surface Applied
SS = Spring, Surface Applied

FI = Fall, Incorporated
SI = Spring, Incorporated

FS-G = Fall, Surface Applied with Guardian®
SS-G = Spring, Surface Applied with Guardian®

FI-G = Fall, Incorporated with Guardian®
SI-G = Spring, Incorporated with Guardian®

N = Nitrogen applied at Planting with no Stabilizer
N-G = Nitrogen applied at Planting with Guardian®

Corn Yields

Yield data showed no significant difference among the treatments with or without the use of the nitrogen stabilizer. There was a highly significant difference ($P > F = 0.0000$) between yields in the surface-applied treatments averaging 78.4 bu/A compared to incorporated treatment yields averaging 60.5 bu/A. Also significant ($P > F = 0.004$) was

the difference between fall-applied manure treatment yields of 76.0 bu/A and spring-applied manure treatment yields of 62.9 bu/A. Yields appeared to be associated with the low emergent plant populations within the different experimental treatments. Average plant population in the fall manure treated plots (27,979 plants per acre) was significantly ($P > F = 0.000$) higher than spring surface-applied average population at 18,240 while spring incorporated plots showed an average population of 13,114 plants per acre.

Nitrogen Utilization

Soil and plant tissue nitrogen data were collected and analyzed to provide an understanding of how much N was available during the critical periods of N uptake by the corn crop. However, the data showed inconclusive results, possibly due to the effects of the climatic conditions experienced. Stalk N tests showed no significant pair-wise difference among the means for the 10 treatment types. Soil tests were collected before fall manure application, at pre side-dress nitrogen timing, and post-harvest. Soil nitrate N data collected at pre side-dress timing showed no significant pair-wise differences among the means of the different treatment types. When comparing change or increase of soil nitrogen from the 10/11/01 to 11/15/02, there were no significant differences by the four main contrast comparisons. However, there were significant pairwise differences between individual treatments as noted in Table 2.

Table 2. Change or Increase in Soil Nitrogen from 10-11-01 to 11-15-02 by Treatment.[a]

Manure Application Treatment	Soil NO_3-N Change 10-11-01 to 11-15-02 ppm
Fall, Incorporated with Guardian®	11.0 a
Nitrogen applied at Planting with no Stabilizer	9.7 ab
Spring, Surface Applied	7.7 abc
Spring, Incorporated with Guardian®	5.8 abc
Nitrogen applied at Planting with Guardian®	4.7 abcd
Spring, Surface Applied with Guardian®	4.5 abcd
Fall, Incorporated	4.4 abcd
Spring, Incorporated	3.5 bcd
Fall, Surface Applied with Guardian®	1.1 cd
Fall, Surface Applied	-0.9 d
LSD (0.05)	6.7
F test	2.5

[a] Means followed by the same letter are not significantly different from each other.

Residue Cover

Residue cover was closely monitored to track the impact of the treatments. The cooperating landowner/operator follows a strict no-till production system. Data were collected and evaluated to determine the best application method and timing to provide

the necessary nutrients without disturbing the no-till production system. Average residue cover never dropped below the NRCS standard on no-till operations of 33% residue cover post-planting. The initial cover of 73% was due to wheat stubble followed by double-crop soybeans in the research plot area. Residue counts taken after manure application and planting revealed a residue cover range of 36% to 47% with fall incorporation being the lowest percentage cover (36%) while the plots receiving no manure application showed the highest post-planting percentage cover (47%). Comparison of the four manure application schemes showed no significant difference in residue cover, thus the incorporation method of manure application did not reduce the residue cover below the 33% cover standard set for no-till cropping systems.

Soil Compaction

Soil compaction readings were taken before manure application, at post-application, and at post-planting at depths of 0 to 8", 8 to 14", and 14 to 20". There were no significant differences among soil compaction readings at any depth for the different application timings or methods.

Summary

Yield averages by treatment ranged from a low of 44 bu/A for the spring-incorporated plots to 81 bu/A for the spring surface plots. The fall treated plots showed no significant difference between surface and incorporated treatments and averaged 75.9 bu/A. The manure application rate was calculated to produce a yield of 140 bu/A corn. We believe these extremely low yields are due to climatic conditions that were beyond our control. The rain in May produced severe crusting of the soil surface, especially on the spring incorporated plots. The AerWay® incorporating tool was run in other (non-plot) areas with no manure applied, and the same low populations and yields resulted. We suspect that manure in the seed germination zone may have contributed to the greater than 50% reduction in plant emergence in the spring-incorporated plots. During July through September, we experienced a severe drought. Excessive spring rain and unseasonably cold weather affected plant populations, causing highly variable yield results. Drought conditions resulted in low overall yields.

However, the cooperating farmers see value in the research and wish to conduct another year of research with slight modifications to the process utilized in 2001-2002. Our results showed that, despite reduced plant populations, the spring surface-manure applications resulted in the highest yields (79.2 bu/ac). We believe that under "normal" conditions, spring incorporation of manure could result in no-till corn yields comparable to those achieved with chemical fertilizers and the best retention of N for future crops. We need more research to quantify the impact of manure incorporation timing and methods on no-till corn emergence and population. For 2003, we are again conducting research on the utilization of manure N under different application timings and application methods. We will be excluding the use of the nitrogen stabilizer in all manure plot treatments.

Acknowledgments

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Comparing Sources, Rates, and Crop Rotation Effects on Corn Yield Response to Nitrogen on Lakebed Soils

Greg La Barge, Extension Agent, Agriculture and Natural Resources

Objectives

To observe yield response when 28% UAN and 82% anhydrous ammonia are supplied at different rates on lakebed soils. Observe yield response to corn-corn and soybean-corn rotations.

Background

Cooperator:	Hoytville Branch, OARDC	Fertilizer:	See Treatments
		Planting Date:	June 1, 2002
County:	Wood	Planting Rate:	30,000 seeds / A
Nearest Town:	Hoytville	Row Width:	30-inch
Drainage:	Tiled	Herbicides:	
Soil type:	Hoytville clay	Soybean-Corn:	Degree Extra 3qt A, Atrazine 1 pt / A, Sterling 6oz / A, Crop oil 9.6 oz / A
Tillage:	Conventional till		
Previous Crop:	See treatments		
Variety:	Pioneer 34B24	Corn-Corn:	2,4-D Ester 1pt / A, Harness 2.75 pt / A, Princep 1qt / A, Roundup 32 oz / A, POST application-Accent 14g / A
Soil test:			
Soybean-Corn:	pH 6.5, P 87 ppm, K 370 ppm		
Corn-Corn:	pH 6.5, P 95 ppm, K 379 ppm	Harvest Date:	October 31, 2001

Methods

This is the fifth-year result of a multi-year nitrogen study on corn at OARDC, Hoytville. Starter nitrogen at the rate of 40 lbs. actual nitrogen per acre was applied in a 2 x 2 placement to all plots. Plot design was a randomized split block design with four replications. Main plots were the rates of nitrogen applied. Subplots were the two sources of sidedress nitrogen. Each subplot consisted of four rows 70 feet long in which the center two were harvested for grain yield.

At V5-V6 stage of corn growth, 28% urea ammonium nitrate (UAN) and 82% anhydrous ammonia was applied at 0, 20, 80, 140, and 200 pounds of N per acre to make a total nitrogen application of 40, 60, 120, 180, and 240 pounds of actual N per acre. The 28% UAN was applied with a solid stream injector behind a no-till coulter.

In 2000, a second series of plots following corn were added to the experiment to separate out the nitrogen contribution from soybeans as a previous crop. This is the second year of this addition.

Results

Table 1. 2001 Corn Yields Resulting from Nitrogen Rates by Crop Rotation.

Total Nitrogen Rate (lbs/A)	Yield (bu/A)	Yield (bu/A)
	Soybeans-Corn	Corn-Corn
40	81.2	82.8
60	82.7	89.9
120	95.9	86.0
180	87.7	92.8
240	87.7	96.8
LSD (0.05)	NS	NS
F test	1.2	1.3

Table 2. Comparison in Yield from the Two Sources of Nitrogen by Crop Rotation.

Source	Yield (bu/A)	Yield (bu/A)
	Soybeans-Corn	Corn-Corn
Anhydrous Ammonia	86.4	91.9
28% UAN	87.6	87.4
LSD (0.05)	NS	NS
F test	3.6	1.9

Summary

The drought of 2002 had a significant impact on the nitrogen plot and overshadowed any treatment effects of the nitrogen. The four-year yield average on these plots was 173 bushels for 1998-2001. The average yield this year is 87 bu/A. Stalk nitrogen tests were taken on two replications, and the results showed very little residual N in the base of the stalk. The harvest height of the corn was less than four feet. In addition to the drought, the planting date of June 1 is a month later than normal due to wet soil conditions that occurred up to that time.

No significant differences in yield were noted with the two sources of nitrogen fertilizer in the soybean-corn plot or the corn-corn in 2002. There was no significant interaction effect for nitrogen source by nitrogen rate for either rotation.

Acknowledgments

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Nitrogen Management Systems Using Urea-Ammonium Nitrate (28%) for Corn

Ed Lentz, Extension District Specialist, Agronomy

Objective

Producers sometimes broadcast urea-ammonium nitrate (28% N solution) with herbicides to reduce application costs (weed 'n' feed program). This practice may lead to unacceptable N losses from volatilization and denitrification. Sidedress N programs may reduce this loss potential and provide more N to the crop, but require another trip. The objective of this study was to compare grain yields between broadcast and sidedress applications of urea-ammonium nitrate.

Background

Cooperator:	OARDC, Northwestern Branch	Planting Date:	May 29, 2002
County:	Wood	Seeding Rate:	30,000 seeds/A
Nearest Town:	Hoytville	Row Width:	30-inch
Drainage:	Tiled	Herbicides:	
Soil type:	Hoytville clay	PRE:	2.4 qt/A Harness Xtra
Tillage:	Conventional till		1 pt/A Atrazine
Previous Crop:	Soybeans		26 oz./A Roundup Ultramax + AMS
Variety:	Pioneer 34B24	POST:	2 pt/A Basagran
Fertilizer:	N = 160 lb/A	Harvest Date:	October 28, 2002
Soil test:	pH = 6.5, P = 104 ppm K = 208 ppm		

Methods

Experimental design was a randomized complete block with three treatments replicated four times. Treatments were as follows:

1. Urea-ammonium nitrate (160 lb N/A) surface applied at planting (broadcast N management system).
2. Urea (20 lb N/A) banded from fertilizer boxes at planting, two inches below and to the side of the seed; followed by urea-ammonium nitrate (140 lb N/A) coultered-injected between rows at growth stage V6 (sidedress N management system).
3. Zero nitrogen check — to estimate yield from soil residual nitrogen.

Plots were 10 feet wide and 70 feet long and consisted of four rows. The center two rows were harvested for grain. A combine scale and sensor estimated grain weight and mois-

ture, respectively. Yield was adjusted to 15% moisture. At silking, 10 ear leaves were collected and sent to Spectrum Analytical Lab for nitrogen content. Harvest population was estimated by counting plants per 17.4 feet of row from each harvest row.

Results

Table 1. Average Corn Grain Yield and Other Agronomic Traits in Response to UAN Management Systems.[a]

Application Method	Grain Yield	Harvest Moisture	Harvest Population	Tissue Nitrogen
	(bu/A)	(%)	(plants/A)	(%)
Broadcast	111.1 a	22.4	25,750	2.6
Injected	106.5 a	21.4	26,000	2.5
Zero N check	87.8 b	20.5	26,875	2.3
LSD (0.05)	14.7	NS	NS	NS
F-test	8.46	<1	<1	2.81

[a] Means followed by the same letter within a column are not significantly different.

Discussion and Summary

Grain yields were similar between a broadcast application of urea-ammonium nitrate at planting and a sidedress application at growth stage V6. Differences may have not been detected because of an abnormally hot and very dry summer, which greatly reduced yields at this site. Normally, yields would be expected between 175 to 200 bu/A.

Tissue nitrogen was below the nitrogen suffiency range (2.9 - 3.5%) for all treatments. Possible restricted root growth and/or lack of soil water movement may have prevented nitrogen uptake by the plants. The lack of differences between the zero check and other treatments for nitrogen uptake would be further evidence of limited nitrogen availability. Root development may have been restricted from early cool, wet conditions followed by hot, dry conditions, which would have reduced nitrogen uptake.

No conclusion from this study should be made about nitrogen application methods for urea-ammonium nitrate. Other factors were more limiting than nitrogen, and masked any differences that may have occurred between application methods.

Acknowledgment

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Use of N-Serv with Sidedress Nitrogen Applications in Corn

Ed Lentz, Extension District Specialist, Agronomy
Gary Wilson, Extension Agent, Agriculture and Natural Resources

Objective

To evaluate the effects that N-serv at sidedress may have on corn yields.

Background

Cooperator:	Tim Jackson	Fertilizer:	Fall applied and incorporated; lime = 3 tons / A; P = variable rate to 30 ppm
County:	Hancock		
Nearest Town:	Findlay		
Drainage:	Systematically tiled	Planting Date:	May 20, 2002
Soil type:	Blount silt loam	Planting Rate:	30,000 seeds / A
Tillage:	Fall chiseled and leveled	Row Width:	30-inch
Previous Crop:	Soybeans	Herbicides:	2.1 qt / A Bicep; 1 lb / A Princep
Variety:	NK 58D1		
Soil test:	pH = 6.0, P = 28 ppm, K = 116 ppm	Harvest Date:	October 15, 2002

Methods

Experimental design was a randomized complete block with two treatments replicated four times. Treatments were 150 lb nitrogen / A from anhydrous ammonia with or without N-serv applied at sidedress. The rate of one qt / A of N-Serv was applied. Plots were 30 feet wide and 1,090 feet long. Grain weight was estimated by a weigh wagon. Grain samples were taken to a nearby elevator to estimate moisture with a commercial tester. Yield was adjusted to 15% moisture. Harvest population was estimated by counting plants from 17.4-foot sections of two center rows per plot.

Results

The average corn grain yield and other agronomic traits response to N-Serv addition are given in Table 1 (means followed by the same letter in a column are not statistically different).

Table 1. Average Corn Grain Yield and Other Agronomic Traits in Response to N-Serv Addition.

N-Serv Added	Harvest Yield (bu/A)	Harvest Moisture (%)	Harvest Population (plants/A)
Yes	112.8	19.6 a	27,375
No	110.2	19.3 b	27,125
LSD (0.05)	NS	0.2	NS
F-test	<1	35.5	<1

Discussion and Summary

The only statistical difference for the study was for harvest moisture, and these values were close for practical purposes. Yield differences may not have been detected because of the abnormally hot and very dry summer. Normally, yields would be expected between 175 to 200 bu/A. Root development may have been restricted from cool and wet early conditions followed by hot, dry conditions, which would have reduced nitrogen uptake.

Because of the abnormally dry weather, no conclusion from this study should be made about N-Serv added to sidedress anhydrous ammonia. The inability of the crop to uptake nitrogen, as well as other problems associated with drought, limited the amount of information obtained from this study. Further research would be required in a more normal year to see if N-Serv application affects grain yield and/or moisture.

Acknowledgment

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Evaluation of Agrotain Urease Inhibitor with UAN Nitrogen Sidedress Applications in Field Corn

Andy Kleinschmidt, Extension Agriculture and Natural Resources Agent
Gary Prill, Extension Associate, Farm Focus/Research Coordinator

Objectives

To evaluate yield response of field corn to two different UAN nitrogen sidedress rates applied using a coulter/injector toolbar with and without Agrotain urease inhibitor. The purpose of this study is to look at the effectiveness of Agrotain at preventing urea nitrogen loss in sidedress applications when the UAN is not knifed into the soil. The potential benefit to farmers is the possibility of reduced nitrogen rates to achieve the same yields.

Background

Cooperator:	Marsh Foundation/ Farm Focus	Herbicide: PRE (April 26):	2.1 qt/A Bicep II Magnum + 1.1 lb/A Princep + 0.8 oz/A Soil Python
County:	Van Wert		
Nearest Town:	Van Wert		
Soil Type:	Hoytville silty clay loam		
Drainage:	Tile- nonsystematic	Insecticide:	6.7 oz per 1,000 row ft. Aztec 2.1G T-banded
Previous Crop:	Wheat		
Tillage:	Summer disk/ripper; Fall field cultivate (2x); Spring field cultivate (1x)	Hybrid:	Corn Belt C-611
		Row Width:	30 inches
		Planting Rate:	29,120 seeds/A
Soil Test (2002):	pH 6.5, P 39 ppm, K 126 ppm	Planting Date:	April 26, 2002
		Harvest Date:	October 4, 2002
Fertilizer:	250 lb/A 8-24-24 in row at planting, UAN sidedress. See Methods.		

Methods

This study is set up with four treatments replicated four times in a complete randomized block design. These treatments are:

1. 110 lb/A nitrogen sidedress applied as UAN
2. 110 lb/A nitrogen sidedress applied as UAN with Agrotain @ 0.25% v/v
3. 160 lb/A nitrogen sidedress applied as UAN
4. 160 lb/A nitrogen sidedress applied as UAN with Agrotain @ 0.25% v/v

Actual as applied weights were taken using portable weigh scales to weigh the applicator between treatments. All as applied rates were within +/- 8 percent of target rates.

All plots had 20 pounds actual nitrogen applied in the row starter fertilizer in addition to the above treatment rates. All sidedress applications were made on June 8 with corn at stage V4 using a 12-row coulter/injector applicator rented from a local fertilizer dealer. No injector alignment adjustments were made prior to or during application.

Rainfall after application was recorded. Plot size was 30 feet (12 rows) wide by 1,030 feet long. Harvest populations (October 03) were estimated by counting the number of plants on each side of a 17.5 feet tape at three different locations in each plot. The average of the number of plants counted per 17.5 feet was converted to plants per acre. The plots were harvested using a John Deere 6620 combine equipped with a calibrated AgLeader PF3000 yield monitor. Yields were calculated based on yield monitor weights and moisture readings. All yields are adjusted to 15% standard moisture.

Results

Table 1. Corn Harvest Population, Moisture, and Yield.

Treatment	Harvest Population (plants/A)	Moisture (%)	Yield (bu/A)
110 lb./A nitrogen	24,800	16.9	98.1
110 lb./A nitrogen w/Agrotain	24,700	16.8	102.1
160 lb./A nitrogen	24,600	16.7	106.5
160 lb./A nitrogen w/Agrotain	24,600	16.9	96.5
LSD (0.05)	NS	NS	NS
F-test	<1	1.2	2.6

NS = not significant

Summary

Agrotain is a urease inhibitor that according to the manufacturer is designed to prevent urea volatilization for a period of about 14 days when applied at the 0.25% volume-to-volume rate (1 qt. per 100 gal.) with 28% UAN liquid fertilizer. This delay allows more time to get the urea incorporated into the soil through rainfall. The first significant rainfalls after sidedress application occurred on June 18 and June 26, with 0.28 inches and 0.38 inches respectively.

The results from this one-year study indicate there was no statistical difference between the four different treatments with regards to harvest population, moisture, or yield. Variation in the yields between the replications of any particular treatment did not enable us to detect significant yield differences between treatments.

The reason for including the lower nitrogen rate treatments (110 lb./A) was to be able to detect possible benefits of the Agrotain urease inhibitor even if yields were lower than normal. However, with corn yields for all the plots as low as they were this season due

to weather, there should have been adequate nitrogen present in all four treatments at the rates applied to support the yields attained.

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Effects of Varying Plant Populations on Agronomic Performance of Corn Hybrids

Peter Thomison, Extension Specialist, Corn Production Systems
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Objective

To evaluate differences in stalk rot, lodging, grain yield, and moisture among hybrids planted at varying plant populations in a field with a history of Gray Leaf Spot.

Background

Cooperator:	Riverview FFA	Row Width:	30 inches
Nearest Town:	Warsaw	Plot Length:	25 feet
Major Soil Type:	Chagrin Loam	N-P-K Fertilizer (lbs):	200-40-40
Previous Crop:	Soybean	Soil Test (pH, P, K):	6.2, 89, 551
Planting Date:	5/24/02	Planting Rate:	26000 and 40000 seeds/A
Harvest Date:	11/13/02		

Methods

Six Pioneer Brand hybrids with varying stalk strength and Gray Leaf Spot resistance were planted with three replications in a split plot design, with seeding rate as the main plot and hybrid as the split. The plots were planted in a field that has a history of Gray Leaf Spot pressure at the Riverview FFA farm, near Warsaw in Coshocton county. The plots were four rows by 25 feet long, with the center two rows harvested.

The hybrids were rated from 4 to 7 for stalk strength and 5 to 6 for Gray Leaf Spot resistance by Pioneer (with 9 being the best).

Results

Table 1. Agronomic Performance of Corn Planted to Varying Plant Densities Under Gray Leaf Spot Pressure, Warsaw, Ohio, 2002.

Brand/Hybrid	Seeding Rate	Yield	Moisture	Final Stand	Lodging	Emergence	Test Wt.
	seeds/A	Bu/A	%	plants/a	%	%	lbs/bu
Pioneer Brand 33J56	26,000	142.2	22.3	29,800	13.3	99.3	58.0
Pioneer Brand 33G26	26,000	145.6	23.1	27,267	15.0	96.3	60.5
Pioneer Brand 34M94	26,000	141.8	19.9	27,600	7.7	98.0	57.2
Pioneer Brand 33D31	26,000	143.2	24.0	28,267	10.3	98.7	56.6
Pioneer Brand 34H31	26,000	152.1	21.1	28,033	16.0	99.0	60.8
Pioneer Brand 34B23	26,000	135.0	21.5	28,600	8.3	97.0	59.4
Pioneer Brand 33J56	40,000	135.2	22.1	41,200	53.3	99.0	58.0
Pioneer Brand 33G26	40,000	160.6	21.7	39,867	58.0	98.7	59.8
Pioneer Brand 34M94	40,000	152.4	19.0	38,067	67.3	97.3	57.3
Pioneer Brand 33D31	40,000	146.2	24.2	37,667	11.7	99.0	56.4
Pioneer Brand 34H31	40,000	150.7	22.2	37,867	5.7	99.3	59.5
Pioneer Brand 34B23	40,000	157.9	21.6	38,633	61.3	97.7	59.1
LSD (0.05)*							
Seeding Rate (S)		NS	NS	167	NS	NS	NS
Hybrid (H)		NS	0.9	1,599	NS	NS	1.0
S x H		NS	NS	NS	35.9	NS	NS

Summary

There was very little Gray Leaf Spot present this year due to the dry conditions throughout the growing season.

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East Central Ohio Corn Performance

Howard Siegrist, Agriculture and Natural Resources Extension Agent

Objective

Evaluate current corn hybrids under high-yield environmental conditions in Fairfield and Licking Counties.

Background

	Fairfield County	*Licking County*
Cooperator:	David Miller	Ohio Foundation Seeds
Nearest Town:	Millersport	Croton
Drainage:	Systematically tiled	Systematically tiled
Soil type:	Centerburg silt loam	Bennington silt loam
Tillage:	Conventional till	Conventional till
Previous Crop:	Soybeans	Soybeans
Soil test:	pH 6.8, P 27 ppm, K 135 ppm	pH 6.6, P 28 ppm, K 140 ppm
Fertilizer:	180-60-90 NPK	196-92-96 NPK
Planting Date:	May 23, 2002	May 23, 2002
Planting Rate:	30,000 seeds/A	30,000 seeds/A
Row Width:	30-inch	0-inch
Herbicides:	2.4 quarts/A Bicep, 2 pints/A Duel	2.4 qt/A Bicep, 3 oz/A Warrior
Harvest Date:	October 2, 2002	October 24, 2002

Methods

All plots were randomized with three replications of each variety. Plots were 30 feet in length and 2 rows wide. The plots were planted individually according to planting recommendations to 30,000 seeds/A. Harvest estimates were made by weighing shelled corn from 17.5 feet of row (1/100th acre) in each variety plot. Yield averages were adjusted to standard moisture of 15.5%.

The stand counts were determined at harvest. The number of broken stalks in each plot was determined just prior to harvest. Only those plants with a stalk broken below the ear were considered stalk lodged. Stalk lodging was reported as a percentage of final plant stand. Root lodging was the percentage of plants with stalks bending at 45 degrees or more from their bases. Individual test weights and moisture levels were averaged for the three replications per site.

(Text continues on page 40.)

Results

Licking County	Yield
110 Days and Less	(bu/A)
Agrigold A6445	212.9
Golden Harvest H-8799	211.9
NK N 64 L5	211.3
LG Seeds LG2540	210.1
Mycogen 2652	209.1
Great Lakes 5929Bt	205.6
Seed Consultants SC 1082	199.0
Clever's 465	198.2
icorn.com 106.X2	197.1
Seed Consultnats SC 1091	195.3
icorn.com 111.Y6	194.5
icorn.com 108.X3	194.0
icorn.com 108.J3	193.3
Seed Consultants SC 1072a	192.5
Sow Right SR1102	187.5
AG Venture AV 696	185.4
Asgrow RX664	183.7
Dekalb DKC 60-08	183.6
Pioneer 34M94	183.0
AG Venture AV 782	182.8
Seed Consultants SC 1070	182.3
Garst 8523IT	179.8
Dekalb DKC 59-08	179.7
Vigoro V4910	178.0
Crow's 4908	176.2
Shur Grow SG-732	175.0
Great Lakes 5555	174.5
icorn.com 103.M1	174.4
Steyer 2383	174.3
LG Seeds LG2569 CL	174.2
NK N 58-F4	174.0
Steyer 2386	173.7
Brodbeck SX109	173.3
icorn.com 108.G9	172.6
Sow Right SR1092	172.5
Clever's 464RR	172.5
Crow's 4905B	172.1
Shur Grow SG-690	169.2
Brodbeck SX210	168.5
Hytest HT7615	168.3
Shur Grow SG-691Bt	168.0
AG Venture AV 783	166.5
Sow Right SR1080	164.6
Hytest HT4612	163.4
Agrigold A6391	162.9
Pioneer 34H31	161.1
Clever's 452YG	157.5
Shur Grow SG-751	156.3
Vigori V5020	155.3
NK NX 6370	154.2
Golden Harvest H-8877	154.2
Steyer 2355	142.6
Croplan 613	138.4
Ag Venture AV 617	138.1
Mean	**177.3**
LSD (0.05)	**23.9**

Licking County	Yield
111 Days and More	(bu/A)
LG Seeds LG2585	205.0
icorn.com 111.E3	203.3
Seed Consultants SC 1140	203.2
LG Seeds LG2601	202.2
Hytest HT7712	196.1
Shur Grow SG-769	195.4
Crow's 8626R	195.3
Clever's 471	194.6
Seed Consultant SC X111	191.5
Vigoro V5800	190.3
LG Seeds LG2622	187.6
Vigoro V5110	186.5
Garst 8464IT	185.9
Agrigold A6490	184.7
LG Seeds LG2587RR	182.0
Croplan 691Bt	181.6
Pioneer 32W86	181.2
Garst 8362IT	180.7
icorn.com 114.P8	180.4
Great Lakes 6192	180.0
Sow Right SR1160	179.9
Asgrow RX764	179.5
Steyer 2490	179.3
Vigoro V5520	178.8
Great Lakes 6259	177.0
Clever's 482	175.9
icorn.com 112.F5	175.4
Seed Consultants SC 1118	173.5
Golden Harvest H-9364	172.8
Clever's 462	171.8
LG Seeds LG2587	168.7
Golden Harvest H-9012	167.7
Mycogen 2A791	167.5
Ag Venture AV 813	166.9
Crow's 5150	166.6
Crow's 4979B	166.3
Pioneer 33D31	165.7
Mycogen 2833	165.3
Sow Right SR1130	164.5
Hytest HT7785	163.5
NK N 70-D5	162.4
Golden Harvest H-8906	162.0
Golden Harvest H-9231	161.6
Sow Right SR1152	161.3
Clever's 470	160.6
Brodbeck SX214	160.5
DeKalb DKC 61-24	157.0
NK N 72-V7	156.5
Mycogen 2722IMI	152.5
Golden Harvest H-9247Bt	150.9
Vigoro V5330	148.4
Mean	**176.3**
LSD (0.05)	**30.7**

Fairfield County	Yield
111 Days and More	(bu/A)
Hytest HT7785	200.7
Pioneer 32W86	198.5
Croplan 691Bt	189.1
Steyer 2490	185.1
Golden Harvest H-8906	184.5
icorn.com 111.E3	183.5
Hytest HT7712	180.2
Crow's 5150	179.7
icorn.com 112.F5	176.1
Seed Consultants SC 1118	175.9
Golden Harvest H-9231	173.4
Clever's 482	171.9
Mycogen 2833	169.4
Sow Right SR1130	168.6
Seed Consultants SC 1140	168.0
NK N 70-D5	167.2
Crow's 4979B	166.9
Vigoro V5520	166.0
Vigoro V5800	165.4
Golden Harvest H-9247Bt	165.4
icorn.com 114.P8	163.0
Mycogen 2A791	161.7
Shur Grow SG-769	161.7
NK N 72-V7	161.4
Great Lakes 6192	161.0
Vigoro V5110	159.4
LG Seeds LG2587	159.2
Garst 8348	158.5
Agrigold A6490	154.2
Vigoro V5330	153.2
Asgrow RX764	153.1
Crow's 8626R	152.4
Garst 8362IT	150.9
LG Seeds LG2622	149.1
DeKalb DKC 61-24	148.6
Mycogen 2722IMI	148.5
Garst 8464IT	147.6
Sow Right SR1152	145.9
LG Seeds LG2585	145.9
LG Seeds LG2601	145.8
Great Lakes 6259	142.0
Brodbeck SX214	135.9
Ag Venture AV 813	131.9
Pioneer 33D31	128.3
Clever's 462	119.5
Mean	**162.7**
LSD (0.05)	**42.8**

Summary

Licking County rainfall data: April 3.60", May 6.20", June 3.90", July 1.50", August 2.20", and September 3.70".

Fairfield County rainfall data: August 0.60", April-August 17.25" cumulative.

Hybrids of 110 days or less maturity tested in Licking County averaged 24.0% on harvest grain moisture, 1.5% lodged stalks, 3.6% root lodging, 0.1% in dropped ears, and 29,254 plants per acre. Fourteen hybrids ranging in yield from 189 to 213 bushels per acre were not significantly different from each other.

In the Licking County test plots, hybrids of 111 days or more of maturity averaged 25.8% in harvest grain moisture, 2.4% lodged stalks, 1.7% in root lodging, 0.1% in dropped ears, and 28,791 plants per acre. Twenty-seven hybrids of 111 days or more maturity ranging in yield from 175 to 205 bushels per acre were not significantly different from each other.

In the Fairfield County test plots, hybrids of 110 days or more maturity averaged 17.6% in harvest grain moisture, 0.2% lodged stalks, 57.1 lb/bu in test weight, and 25, 525 plants per acre. Twenty-eight hybrids ranging in yield from 159 to 201 bushels per acre were not significantly different from each other.

Acknowledgment

The author would like to thank Seed Consultants, Inc., for contributing time and equipment in the planting, spraying, and harvest of the Fairfield County trials.

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Evaluation of Blue and Red Food-Grade Corns

Peter Thomison, Extension Specialist, Corn Production Systems
Allen Geyer, Research Associate, Horticulture and Crop Science

Objective

To compare the agronomic performance of blue corn hybrids, blue open pollinated corn, and red open pollinated corn with conventional (yellow dent) corn.

Background

Cooperator:	OARDC Western Branch	Cooperator:	OARDC NW Branch
Nearest Town:	South Charleston	Nearest Town:	Hoytville
Major Soil Type:	Kokomo Silt Loam	Major Soil Type:	Hoytville Silty Clay
Previous Crop:	Soybean	Previous Crop:	Soybean
Planting Date:	5/16/02	Planting Date:	5/29/02
Harvest Date:	10/17/02	Harvest Date:	10/27/02
Row Width:	30 inches	Row Width:	30 inches
Plot Length:	25 feet	Plot Length:	25 feet
N-P-K Fertilizer (lbs):	220-40-40	N-P-K Fertilizer (lbs):	220-40-40
Soil Test (pH, P, K):	5.9, 122, 364	Soil Test (pH, P, K):	5.2, 106, 647

Methods

Three blue corn hybrids, one open pollinated blue corn, one open pollinated red corn, and one yellow dent conventional corn were planted in a randomized complete block design with three replications. The plots were planted at two Ohio locations, OARDC Western Branch in west-central Ohio and OARDC Northwest Branch in northwestern Ohio. The plots were four rows by 25 feet long, with the center two rows harvested. The blue and red corns were planted at 26,000 seeds per acre, and the conventional yellow dent corn was planted at 30,000 seeds per acre.

Results

Table 1. Agronomic Performance at Hoytville, Ohio, 2002.[a]

Brand/Hybrid	Yield	Moisture	Final Stand	Lodging	Emergence	Silking
	Bu/A	%	plants/a	%	%	days after Jan 1
Lfy2304B (Blue Hybrid)	39.6 b	21.0 a	26,167 cd	18.3 b	93.0 a	219 b
Blue Hybrid	41.7 b	21.2 a	28,500 b	19.0 b	95.3 a	218 b
Red (P)	15.1 c	15.4 b	18,333 e	79.0 a	66.3 c	224 a
Hopi Fedco Blue (OP)	24.6 c	14.8 b	25,700 d	59.3 a	88.7 b	218 b
Lfy2361B (Blue Hybrid)	40.4 b	20.8 a	27,333 bc	19.0 b	95.0 a	219 b
Pioneer 34B23 (Yellow Check)	82.7 a	20.9 a	31,833 a	12.7 b	94.7 a	217 b
LSD (0.05)	11.5	3.0	1,321	37.5	3.3	2

[a] Means in same column followed by same letter are not significantly different.

Table 2. Agronomic Performance at South Charleston, Ohio, 2002.[a]

Brand/Hybrid	Yield	Moisture	Final Stand	Lodging	Emergence	Silking
	Bu/A	%	plants/a	%	%	days after Jan 1
Lfy2304B (Blue Hybrid)	99.0 b	19.2 a	26,333 bc	33.0 c	94.3 ab	206 a
Blue Hybrid	89.5 b	19.9 a	24,167 cd	21.7 cd	81.3 cd	207 a
Red (OP)	25.8 c	20.6 a	12,433 e	70.0 b	43.7 e	207 a
Hopi Fedco Blue (OP)	47.6 c	14.4 b	22,367 d	98.0 a	75.7 d	206 a
Lfy2361B (Blue Hybrid)	111.8 b	17.1 b	29,633 a	40.0 c	97.3 a	206 a
Pioneer 34B23 (Yellow Check)	197.3 a	18.0 b	28,267 ab	6.0 d	85.7 bc	203 b
LSD (0.05)	22.7	2.2	3,202	18.8	9.4	1

[a] Means in same column followed by same letter are not significantly different.

Summary

Dry weather at the Northwestern Branch severely reduced yields of all corn in the area. The yields of all of the blue and red corns were significantly lower than the yellow dent check. Lodging among the blue and red corns was higher than the yellow dent check, with the open pollinated corns having the most severe lodging.

Producers who are interested in growing specialty color corns should seek out a buyer before the growing season begins to determine if a specific hybrid (or variety) should be grown and to determine what premiums are being paid to determine if the premiums will offset the lower yields. Using these results, a producer can expect a significant yield loss for these specialty corns.

Specialty color corns need to be grown a minimum of 600' away from normal yellow dent corn to minimize any cross pollination which may result in off-color grain.

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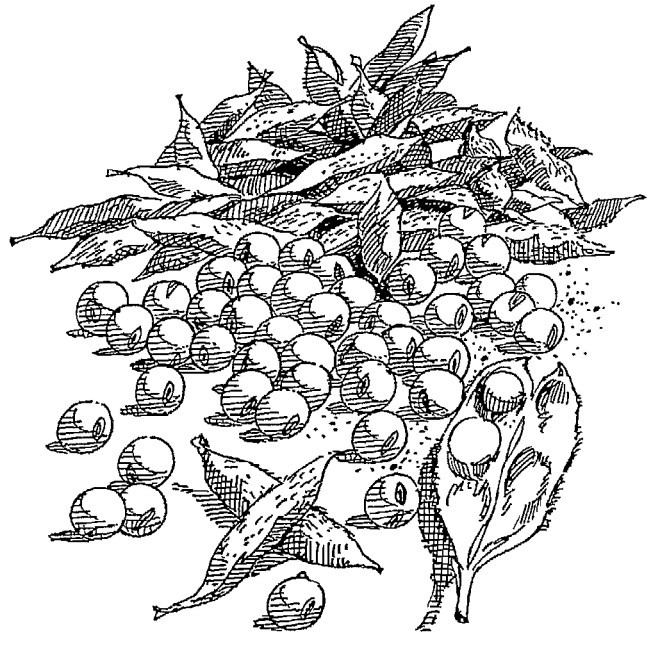
Soybean Management



Early and Late Planted Soybeans

Ed Lentz, Extension District Specialist, Agronomy
Alan Sundermeier, Extension Agent, Agriculture and Natural Resources

Objective

To evaluate the effects planting date may have on soybean yields.

Background

Cooperator:	OARDC Northwestern Branch	Fertilizer:	100 lbs. 0-46-0 150 lbs. 0-0-60
County:	Wood	Planting Date:	See Methods
Nearest Town:	Hoytville	Seeding Rate:	200,000 seeds / A
Drainage:	Tiled	Row Width:	7.5-inch
Soil type:	Hoytville clay	Herbicides:	PRE: 3.4 oz. Canopy SP; 16 oz. 2, 4-D Ester POST: 26 oz. Roundup Ultra Max +AMS
Tillage:	Disk		
Previous Crop:	Corn		
Variety:	Pioneer 93B01		
Soil test:	pH 6.5, P 104 ppm, K 208 ppm	Harvest Date:	October 9, 2002

Methods

Experimental design was a randomized complete block with three treatments replicated four times. Treatments were three planting dates: May 1, June 11, and June 17. A Great Plains No-till drill was used at planting. Plots were 10 feet wide and 74 feet long. The center 11 rows of each plot were harvested for grain yield. A plot combine scale and moisture sensor was used to estimate grain weight and moisture, respectively. Yield was adjusted to 13% moisture. Harvest population was estimated by counting plants from four adjacent rows for 6.5 feet from three areas of each plot.

Results

The average soybean grain yield and other agronomic traits response to planting date are given in the table on the following page.

Table 1. Soybean Yield, Moisture, and Population.[a]

Planting Date	Grain Yield (bu/A)	Harvest Moisture (%)	Harvest Population (plants/A)
June 11	43.7 a	14.1 b	169,772 a
May 1	41.9 ab	12.7 b	140,509 b
June 17	34.7 b	12.2 a	137,605 b
LSD (0.05)	7.6	1.1	19,824
F-test	5.0	9.6	9.7

[a] Means followed by the same letter in a column are not statistically different.

Discussion and Summary

Yields were similar for the May 1 and June 11 planting date. Even though only six days later, the June 17 planting had statistically lower yields than June 11. The June 11 planting date was significantly higher in moisture but well within a desirable level for harvest. Populations were best for the June 11 planting, reduced for the May planting because of slow emergence from cool and wet soils, and reduced for the June 17 plantings because of unusually hot and dry conditions. Historically, early May plantings have larger yields than June; however, the May 1 planting was more like a late May planting since emergence did not begin until about May 20. Conditions were also relatively wet and cool until the June 11 planting, then soils began to dry out with warmer conditions. The June 11 planting probably had the best conditions for stand establishment. After the June 17 planting, significant rain events did not occur until the end of July, affecting growth and yields.

In summary, at this site in 2002, conditions were best for soybean growth around June 10. Earlier plantings had poorer and less uniform stands from an extended emergence period caused by abnormally cool and wet conditions, and later plantings were affected by abnormally hot and dry conditions. Yields would be expected to be larger for early May plantings than June in a normal year.

Acknowledgment

The authors of this report are grateful for the support provided by the OARDC staff at the Northwestern Branch.

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Apron Maxx (mefenoxam and fludioxonil) Seed Treatment Comparison for Soybeans

Alan Sundermeier, Agriculture and Natural Resources Extension Agent

Objective

To evaluate the effect of fungicide seed treatment on soybean stand and yield.

Background

Cooperator:	Ed and Howard Rosebrook	Soil test:	pH 6.7, P 24 ppm, K 153 ppm
County:	Henry		
Nearest Town:	Deshler	Fertilizer:	None
Drainage:	Tile, well-drained	Planting Date:	May 30, 2002
Soil type:	Hoytville clay	Planting Rate:	225,000 seed / acre
Tillage:	No- till	Row Width:	7-inch
Previous Crop:	Corn	Herbicides:	Roundup
Variety:	Rupp RS4230RR	Harvest Date:	September 24, 2002

Methods

Rupp RS4230RR soybean seed treated with Apron Maxx was compared to the same variety with no seed treatment. Seed treatment was applied at Rupp Seed Company at the recommended rate of 5 fl. oz. per 100 pounds of seed. The seed used was rated at 90 percent germination. The two treatments were replicated five times in a randomized complete block design. Individual soybean plot size was 30 feet wide by 930 feet long (0.64 A). A 20-foot wide strip was harvested from the center of the plot the length of the strip. The soybeans were harvested using a combine with a yield monitor at an average grain moisture of 13.7%.

Spring emergence population counts were taken using the hoop method. Harvest population was determined by counting the soybean plants in 3 feet of row for four rows per treatment.

Results

Table 1. Soybean Population and Yield.[a]

Seed Treatment	Population Growth Stage Emerging	Population Growth Stage V2	Harvest Population	Yield
	(plants/A)	(plants/A)	(plants/A)	(bu/A)
Treated	220,362 a	281,860	181,860	60.4
Untreated	184,488 b	204,990	179,682	58.6
LSD (0.05)	17,425	NS	NS	NS
F-test	33.9	<1	<1	1.4

[a] Means followed by the same letter in same column are not significantly different.
NS = Not Significant

Summary

A uniform stand was achieved for both treatments. Weed control in all the plots was very good. A timely rain allowed crop yields to be near normal for this area.

There were no significant differences in yields among the treatments. The Apron Maxx treated soybeans had a significantly higher stand population at emergence, but final harvest stand populations were not statistically different.

Acknowledgment

Thanks to Rupp Seed Company for donating the seed used in this study. Thanks also to Ed and Howard Rosebrook for cooperating in this study.

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Soybean Response to Nitrogen

Glen Arnold, Agriculture and Natural Resources Extension Agent
Ed Lentz, District Extension Agronomy Specialist

Objective

To evaluate the effect nitrogen may have on soybean yields

Background

Cooperator:	Glenn Karhoff	Soil test:	pH 6.5, P 70 ppm, K 180 ppm
County:	Putnam		
Nearest Town:	Glandorf	Fertilizer:	None
Drainage:	Tiled with 45 ft spacing	Planting Date:	May 11, 2002
Soil type:	Clay loam	Seeding Rate:	180,000 seeds/acre
Tillage:	No till	Row Width:	15-inch
Previous Crop:	Corn	Herbicides:	Roundup Ultra 1 qt/A + AMS
Variety:	Dekalb 31-51		
		Harvest Date:	October 8, 2002

Methods

Experimental design was a randomized complete block with three treatments replicated five times. Treatments included a zero N check and a 50-lb/A N treatment from urea-ammonium nitrate solution (28%) coultered-injected between rows (30-inch spacing) on June 20 and August 10. The plots were planted with a Kinze 2000 planter. Individual plot size was approximately 1/4 acre.

The soybeans were planted in 30-foot wide strips for a length of about 360 feet. Using a John Deere 6620, a 20-foot wide strip was harvested the length of the plot and weighed using a weigh wagon. Grain yield was adjusted to 14% moisture.

Harvest population was approximately 120,000 plants per acre.

Results

Table 1. Soybean Yield and Harvest Moisture.[a]

N application (month)	GrainYield (bu/A)	Harvest Moisture (%)
June	48.0 a	11.0
none	46.0 b	11.0
August	45.4 b	11.0
LSD (0.05)	1.6	NS
F-test	7.8	<1

[a] Means followed by the same letter in same column are not significantly different.

Summary

The test plot had a uniform stand. The growing season was droughty. There was some damage to the soybean stands caused by the nitrogen application equipment. The operator believes the damage can be minimized next year.

The two-bushel-per-acre yield gain from June-applied nitrogen was statistically different from the check. However, given the cost of the nitrogen applied and the operator's time and equipment, the yield gain did not appear to increase profits. The August-applied nitrogen yield was not significantly different than the check. The operator plans to replicate the study next year to determine if statistically different yields occur in a normal (adequate rainfall) growing season.

Acknowledgment

The authors would like to thank Glenn Karhoff and Karhoff Farm Seeds for cooperating in this study.

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Preplant Residual Herbicide Study in Roundup Ready Soybeans

Andy Kleinschmidt, Extension Agriculture and Natural Resources Agent
Gary Prill, Extension Associate, Farm Focus/Research Coordinator

Objectives

To evaluate potential yield benefits of using a preplant residual herbicide in with an initial burndown treatment in no-till Roundup Ready soybeans that will receive a planned post-emergence treatment with glyphosate. The speculation is that a residual herbicide treatment will reduce early weed competition, thus improving yields.

Background

Cooperator:	Marsh Foundation/ Farm Focus	Herbicides:	
		PREPLANT: (April 24)	Variable (see Methods)
County:	Van Wert		
Nearest Town:	Van Wert	POST: (June 25)	40 oz/A Roundup UltraMax + 3.4 lb/A AMS
Soil Type:	Hoytville silty clay loam		
Drainage:	Tile — nonsystematic	Insecticide:	None applied
Previous Crop:	Corn	Variety:	Wellman 3826RR
Tillage:	No-till	Row Width:	7.5 inch
Soil Test (2002):	pH 6.1, P 83 ppm K 155 ppm	Planting Rate:	230,000 seeds/A
		Planting Date:	May 31, 2002
Fertilizer:	none applied	Harvest Date:	September 25, 2002

Methods

This study was set up with four treatments replicated four times in a complete randomized block design. These treatments are:

1. 1.25 pt/A Boundary + 1.5 pt/A Touchdown + 1 pt/A 2,4-D LVE + 3.4 lb/A AMS
2. 10 oz/A Domain + 20 oz/A Roundup Ultra Max + 1 pt/A 2,4-D LVE + 3.4 lb/A AMS
3. 0.8 oz/A Python + 1.5 pt/A Glyphomax Plus + 1 pt/A 2,4-D LVE + 3.4 lb/A AMS
4. 20 oz/A Roundup UltraMax + 1 pt/A 2,4-D LVE + 3.4 lb/A AMS (Control burndown)

The study was planted using a Great Plains 2010 no-till drill. Plot size was 45 feet wide by 1,030 feet long. A whole-field post-emergence herbicide application was made using 40 oz/A Roundup UltraMax + 3.4 lb/A AMS. Yields were collected from one combine round (28 feet width) from the center of each plot. Individual plot weight and moisture

was determined using a calibrated AgLeader PF3000 yield monitor in a John Deere 6620 combine. Yields reported in this study have been adjusted to 13% moisture standard.

Harvest populations (September 19) were estimated by counting the number of plants in a row on each side of a 10-foot section at three different locations in each individual plot. The average of the number of plants counted per 10 feet was converted to plants per acre.

Results

Table 1. Harvest Population, Moisture, and Yield.[a]

Treatment	Harvest Population (plants/A)	Moisture (%)	Yield (bu/A)
1	195,100 a	11.9	53.2
2	191,100 a	11.8	54.4
3	193,400 a	11.9	54.1
4	181,200 b	11.9	53.2
LSD (0.05)	9,600	NS	NS
F-test	4.3	<1	1.3

[a] Means followed by the same letter in the same column are not significantly different.
NS = not significant

Summary

Residual herbicides may reduce early weed competition thus improving yields; conversely, glyphosate-tolerant soybean varieties may offer producers an opportunity to develop a soybean weed-management program that has the potential to provide economically viable weed control without a residual herbicide. Results from this one-year study indicate there were no statistically different yields among the four treatments.

In this study, 37 days elapsed from burndown to planting due to unfavorable weather. Original study design anticipated soybean planting to occur within seven to 14 days following burndown application. As such, results from this study are atypical, and no conclusive statement can be made regarding potential yield benefits of using a preplant residual herbicide in with an initial burndown treatment in no-till Roundup Ready soybeans.

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Effects of Time of Day of Glyphosate Applications on Weed Control

Steve D. Ruhl, Agriculture and Natural Resources Extension Agent
Jeff Stachler, Horticulture and Crop Science Extension Program Specialist

Objective

Previous Ohio State University small plot research has shown an effect of time of day for effectiveness of herbicide applications. These studies also used lower than normal rates on larger than normal weeds to assure a time of day effect. This study investigated the effect of the time of day of glyphosate using recommended rates on recommended sizes of target weeds.

Background

Cooperator:	Tom Weiler	Soil Test:	pH 7.0, P 23 ppm, K 154 ppm
County:	Morrow		
Nearest town:	Chesterville	Fertilizer:	None
Drainage:	Systematically tiled	Herbicides:	Roundup UltraMax at 26 oz/A
Soil type:	Sloan silty clay loam		
Tillage:	Conventional	Planting Date:	May 22, 2002
Previous Crop:	Corn	Planting Rate:	203,000 seeds/acre
Variety:	Golden Harvest H-3243	Row Width:	10 inches
		Harvest Date:	October 11, 2002

Methods

The field chosen had high giant ragweed and moderate to high common lambsquarters pressure. Annual grass and smooth pigweed pressure was light and variable. The study used six time treatments — Roundup UltraMax applied at 26 fluid ounces per acre at 6 a.m., 9 a.m., 12 p.m., 6 p.m., and 9 p.m. and an untreated check. Ammonium sulfate was added at 17.0 pounds/100 gallon of spray mixture. Experimental design was a randomized complete block with four replications and a plot size of 10 feet wide by 40 feet in length. Applications were made on June 19th when the giant ragweed was six to 10 inches tall. Weed control was visually evaluated on August 22 on a scale of 0 to 100 percent, with zero indicating no control and 100 percent indicating complete weed control. The center 6.6 feet of each plot was harvested with a plot combine.

Results

Table 1. Effect of Application by Time of Day on Giant Ragweed and Common Lambsquarters Control and Soybean Yield.[a]

Treatment (Time of Application)	Weed Control[bc] Giant Ragweed %	Common Lambsquarters %	Soybean Yield[c] bu/A
6:00 a.m.	78 b	98.0 b	63.5 bc
9:00 a.m.	100 a	98.5 ab	70.9 a
12:00 p.m.	100 a	100.0 a	68.6 ab
6:00 p.m.	98 a	99.3 ab	66.7 abc
9:00 p.m.	79 b	99.3 ab	61.0 c
LSD (0.05)	9.8	1.7	6.1
F test	13.3	2.2	2.7

[a] Roundup UltraMax was applied at 26.0 ounces/A plus AMS at 17.0 lb/100 gallon of spray mixture on June 19 at a spray volume of 20 gallons/A at 30 PSI.
[b] Plots visually evaluated on August 22, 2002.
[c] Treatment means followed by the same letter are not significantly different.

Summary

There was a significant effect of time of day of application of glyphosate with the control of giant ragweed. Giant ragweed control was significantly lower when the glyphosate was applied at 6 a.m. and 9 p.m. In fields with high giant ragweed pressure, glyphosate should be applied somewhere between 9 a.m. and 6 p.m. to maintain maximum control.

The only significant difference in timing for common lambsquarters control was between the 6 a.m. and 12 noon applications. However, lambsquarters control was excellent no matter when glyphosate was applied.

The reduced weed control significantly lowered soybean yield when glyphosate was applied at 6 a.m. and 9 p.m. compared to being applied at 9 a.m. There appeared to be a time-of-day effect for smooth pigweed and not for annual grasses, but due to the variable and light pressure of these two species, evaluations could not be made.

Acknowledgment

The authors would like to extend their thanks to cooperating farmer, Tom Weiler. Also thanks to Dr. Jim Beuerlein for harvesting the plots and Golden Harvest for furnishing the soybean seed.

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Time of Day Post-Emergence Application of Selected Herbicides in Soybeans

Andy Kleinschmidt, Extension Agriculture and Natural Resources Agent
Gary Prill, Extension Associate, Farm Focus/Research Coordinator

Objectives

To evaluate weed control effectiveness of three different postemergence herbicides based on the time of day in which applications were completed in soybeans. This study will help to show farmers the effect different time of the day applications can have on weed control when these specific herbicides are used.

Background

Cooperator:	Marsh Foundation/ Farm Focus	Fertilizer:	None applied
		Herbicides:	
County:	Van Wert	POST:	8 oz/A Fusion +
Nearest Town:	Van Wert	(June 24)	1% v/v COC
Soil Type:	Hoytville silty clay loam	POST:	Variable
Drainage:	Tile - nonsystematic	(July 1)	(see Methods)
Previous Crop:	Corn	Insecticide:	None applied
Tillage:	Fall disk/ripper, spring field cultivate (2 times)	Variety:	Seed Consultants SC9302 RR
Soil Test (2002):	pH 6.1, P 45 ppm K 161 ppm	Row Width:	15 inch
		Planting Rate:	200,000 seeds/A
		Planting Date:	June 1, 2002

Methods

There are a total of 18 different treatments in this study involving three different post-emergence herbicide programs applied at six different times during the day. The study is set up in a randomized complete block design with four replications. The study was planted using a John Deere 7000 Maxemerge six-row planter with a splitter attachment to obtain a 15-inch row spacing. Herbicide treatments are:

1. Flexstar @ 1.33 pt/A + MSO @ 1% v/v + UAN @ 2% v/v
2. FirstRate @ 0.3 oz/A + NIS @ 0.25% v/v + UAN @ 2.5% v/v
3. Roundup UltraMax @ 26 oz/A + AMS @ 17 lb/100 gallons

Seven days prior to the application of the treatments, a postemergence application of Fusion @ 8 oz/A was sprayed perpendicular to all the plots with a 45' Great Plains field sprayer to control grasses. Applications of the treatments were made on July 1 at 6 a.m., 9 a.m., 12 noon, 3 p.m., 6 p.m., and 9 p.m. The following weeds were present at the time of application (weed size in parenthesis): lambsquarters (4 to 6"), velvetleaf (4 to 6"), common cocklebur (4 to 6"), and common ragweed (2 to 4"). All herbicides were ap-

plied in 15 gallons of spray solution per acre with 36 to 40 psi pressure using flat fan nozzles with a CO_2 delivery system on an ATV. Plot spray size is 12.5 feet wide by 535 feet long with a 2.5 foot running check between each plot. The plots were visually evaluated on August 29 for control of lambsquarters, velvetleaf, and pigweed. Each weed species in a plot was evaluated on its percent control between 0 and 100. One hundred percent represents perfect control, while 0 represents no control. Ohio State University Extension personnel conducted the evaluations.

Results

Table 1. Environmental Conditions and Visual Evaluation of Control of Velvetleaf in Soybeans.[a]

Application Time of Day	Dew	Wind Speed, Direction (mph)	Air Temperature (oF)	Flexstar (%)	FirstRate (%)	Roundup UltraMax (%)
6:00 a.m.	no dew	0-5, west-southwest	77	69 c	59 d	100
9:00 a.m.	no dew	0-5, west	85	77 ab	63 cd	100
12:00 p.m.	no dew	0-5, west	93	75 abc	75 b	100
3:00 p.m.	no dew	4-8, west	94	80 a	76 ab	100
6:00 p.m.	no dew	5-10, west	96	76 abc	81 a	100
9:00 p.m.	no dew	0-5, west	90	60 d	67 c	99
			LSD (0.05)	7.6	5.6	NS
			F-test	8.2	20.3	1

[a] Means followed by the same letter in the same column are not significantly different.
NS = not significant

Summary

Only velvetleaf control was summarized in the results section, as velvetleaf distribution was very consistent throughout the plots. Pigweed distribution was much lower than that of velvetleaf, and several plots could not be rated for pigweed control, so it was not included in the results. Lambsquarters control was also not included in these results, since the use of FirstRate and Flexstar do not provide effective control of lambsquarters.

FirstRate and Flexstar showed similar trends for velvetleaf control based on time of day for herbicide application. For Flexstar, application times between 9 a.m. and 6 p.m. provided greater control of velvetleaf than the application times of 6 a.m. and 9 p.m. For FirstRate, application times between noon and 6 p.m. provided greatest control of velvetleaf compared to application times of 6 a.m., 9 a.m., and 9 p.m. Roundup Ultra-Max performance on velvetleaf was unaffected by time of day of application for this study.

Acknowledgment

The authors express appreciation to Jeff Stachler and Ed Lentz for their cooperation with weed ratings, and Mark Loux and Anthony Dobbels for their assistance with the study design.

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Yield and Quality Characteristics of Food-Type Soybeans

Greg La Barge, Extension Agent, Agriculture and Natural Resources

Objective

To determine yield, protein and oil characteristics of food-type soybean varieties.

Background

Cooperator:	Bill Shininger	Fertilizer:	None
County:	Fulton	Herbicide:	Dual 2 pts/A
Soil Type:	Mermill loam		Raptor (4 oz/A)
Tillage:	Chisel plow fall,		/Select (6 oz/A)
	field cultivator (spring)	Variety:	See table
Previous Crop:	Corn	Planting Date:	May 31, 2001
Soil Test:	pH 7.1, P 53 ppm,	Seeding Rate:	180,000 seeds/A
	K 230 ppm, OM 2.2%,	Harvest Pop:	Average 145,000 plants/A
	CEC 8.1 meq/100g	Harvest Date:	October 13, 2001

Methods

The plot design was a randomized complete block with three replications. Plots were 14 ft x 22.5 ft. The plots were planted with a planter in 15-inch row spacing. Varieties were solicited with clear or yellow hilum from several companies that donated the seed. The growing season started wet in May after planting and was dry during July and August. Samples were collected at harvest for analysis of protein, oil, and seed size with analysis performed by the PSL Genetics, Tipton, Ind., using standard analytical procedures.

Table 1. Variety Characteristics

Varieties	Maturity	Hilum Color	Company Providing Seed
OSIA 3136	2.6	Clear	Ohio Seed Improvement Association
OSIA 3850	2.6	Clear	Ohio Seed Improvement Association
OHFG3	2.7	Clear	Ohio Seed Improvement Association
OHFG1	3.3	Clear	Ohio Seed Improvement Association
Beeson	2.6	Light BLK	Ohio Seed Improvement Association
Thorne	3.1	BLK	Ohio Seed Improvement Association
OSIA 3818	2.7	BLK	Ohio Seed Improvement Association
OSIA 3145	2.7	Clear	Ohio Seed Improvement Association
SQC 2900F	3.1	Clear	Shininger Quality Seeds, Delta, Ohio
Rupp 272	2.7	Clear	Rupp Seeds, Inc., Wauseon, Ohio
Rupp 271	2.7	Clear	Rupp Seeds, Inc., Wauseon, Ohio
Rupp 274	2.7	Clear	Rupp Seeds, Inc., Wauseon, Ohio
Rupp 281	2.8	Clear	Rupp Seeds, Inc., Wauseon, Ohio
Rupp 282	2.8	Clear	Rupp Seeds, Inc., Wauseon, Ohio
SQC 2803F	2.8	BLK	Shininger Quality Seeds, Delta, Ohio
OSIA 3140	3.4	Clear	Ohio Seed Improvement Association

Results

Table 2. Soybean Yield and Quality.

Variety	Average Yield (bu/A)	Seed Size (#/lb)	Oil (%)	Fiber (%)	Protein (%)
Rupp 272	41.3	2277	20.7	5.3	43.0
OHFG1	40.3	2145	21.8	5.3	41.2
OSIA 3140	38.5	2520	22.3	5.5	41.0
SQC 2803F	37.7	2322	20.9	5.5	42.8
OHFG3	37.3	2043	21.3	5.4	42.5
Rupp 274	37.1	2115	21.1	5.2	42.8
SQC 2900F	36.9	2657	22.0	5.6	39.5
Rupp 271	36.6	2223	21.2	5.2	42.3
Rupp 282	36.0	2180	21.4	5.3	42.2
Beeson	34.6	2313	21.8	5.3	41.4
OSIA 3818	34.5	2190	21.4	5.4	42.1
OSIA 3145	34.3	2270	21.3	5.4	42.1
OSIA 3850	34.3	2497	22.4	5.2	41.7
OSIA 3136	33.7	2313	21.3	5.3	42.4
Thorne	32.6	2740	22.0	5.5	41.9
Rupp 281	32.0	2125	21.2	5.2	42.7
LSD (0.05)	NS				
F test	<1				

Discussion

Beeson and Thorne are standard varieties found desirable by Japanese markets for food uses other than tofu. They were included for comparison of yield and quality factors. The OSIA 3818 line is not really a food-type line; however, its special trait is low linolenic acid in the oil. Desirable food-type beans for export markets tend to have a higher protein and larger seed characteristics.

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Soybean Foliar Fertilization

Greg La Barge, Extension Agent, Agriculture and Natural Resources

Objective

To determine yield response of soybeans to foliar fertilization with manganese containing fertilizers on deficient soils.

Background

Cooperator:	Nate Andre	Variety:	Garst 269RR
County:	Fulton	Planting Date:	May 25, 2002
Soil Type:	Mermill loam	Seeding Rate:	180,000 seeds/A
Tillage:	No-till	Row Width:	10-inch
Previous Crop:	Corn	Herbicides:	26 oz/A Roundup
Soil Test:	pH 7.1, P 33 ppm, K 77 ppm, Mn 7 ppm, OM 5.3%, CEC 12 meq/100g	Harvest Pop:	150,000 plants/A
		Harvest Date:	October 8, 2002
Fertilizer Rate:	No broadcast; See Table 2		

Methods

A field area known to be manganese deficient was divided into plots 10 feet wide by 40 feet long in a randomized complete block design with six replications. Foliar fertilizer containing only manganese was compared to products containing other nutrients and growth regulators. The products and their label-reported concentrations of nutrient are included in Table 1. Products were applied according to labeled rates. All products except the XBX were applied in 20 gallons of water per acre using a CO_2 sprayer and 10-foot boom with TeeJet XR11004VS nozzles on 7/10/02 at 20 PSI. The XBX was applied in 10 gallons of water per acre on 8/9/02. Soybeans for the July application were in the R1 stage of growth with first flowers starting and six leaves. Table 2 lists the application treatments.

The products were used on this basis: Postman was used as a primary Mn source. Harvest More Urea Mate was used as a total foliar program. X-cyte and Stimulate are hormone-containing products intended to reduce stress and provide for more fruit set. Golden Harvest Plus 5-18-2 is very acidic and added to lower the acidity of the spray solution in combination with a lower rate of Mn product. XBX is an experimental product containing boron (B) since it is presumed that additional B may set more pods.

Table 1. Product Analysis Information.

Product	lb/gallon	Analysis
Post-man	10.5	5% Mn Chelate, 2% S
Harvest More Urea Mate	Dry	5-10-27 with 4% Ca, 1.5% Mg, 0.15% B, 0.008% Co, 0.03% Cu, 0.5% Mn, 0.008% Mo, 0.5% Zn
X-Cyte	8.4	0.04% Cytokinin
Stimulate	8.4	009% Cytokinin, .005% Gibberellic Acid, .005% Indole-3-butyricacid
XBX	10.0	4.5% B
Golden Harvest 5-18-2	11.2	5-18-2 with 0.4% Mg, 1% S, 0.1% B, 0.1% Cu, 0.05% Co, 0.4% Fe, 0.4% Mn, 0.05% Mo, 0.8% Zn

Results

Table 2. Treatments and Soybean Yields Adjusted to 13% Moisture.

Treatment	Yield
	(bu/A)
Postman (3 qt/A)	36.5
Postman (1 qt/A) + Ureamate (5 lbs/A)	36.4
Ureamate (5 lbs/A)	34.1
Postman (1 pt/A) + Ureamate (5 lbs/A) + X-cyte (8 oz/A) + Stimulate (2 oz/A) + XBX (32 oz/A)	33.9
Postman (3 qt/A) + Ureamate (5 lbs/A)	33.3
Postman (1 qt/A) + 5-18-2 (10 oz/A)	32.7
Postman (1 pt/A) + Ureamate (5 lbs/A) +X-cyte (8 oz/A) + Stimulate (2 oz/A)	32.7
Check	31.4
LSD (0.05)	NS
F	<1.0

Discussion

At the time of treatment application on July 10, plants in the treatment area showed foliar symptoms of manganese deficiency. The treatments were applied the day after a 0.5-inch rain shower and temperatures had cooled from the upper 90s during the previous 10 days to the low to mid 80s. All treatments including the check improved in coloration after this period and throughout the rest of the growing season. One may surmise that cooler temperatures and moisture allowed enough root growth to tap available Mn soil reserves. Thus, there were no significant differences in yield among the treatments.

Soil phosphorus and potassium levels were less than optimum; however, no broadcast treatment was applied. At 10 meq/100g CEC, crop removal applications of 90 pounds K_2O (50 Bu/A yield goal) per acre are recommended for soil test levels of 100-130 ppm K. At 75 ppm K soil test level 130 pounds K_2O are recommended. This lower potassium soil test level with no broadcast application may have limited yield potential particu-

larly with the dry 2002 growing season resulting in less expression of the foliar treatments. Yield expectations are usually 50 to 60% more than what was experienced this year.

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Licking County Soybean Tests

Howard Siegrist, Agriculture and Natural Resources Extension Agent

Objective

Evaluate current Roundup Ready and conventional soybean varieties under high-yield environmental conditions in Licking County.

Background

Cooperator:	Ohio Foundation Seeds	Planting Date:	June 10, 2002
County:	Licking	Planting Rate:	170,000 seeds/A
Nearest Town:	Croton	Row Width:	10-inch
Drainage:	Systematically tiled	Herbicides:	
Soil type:	Clay silt loam	PRE:	2 pt/A Dual
Tillage:	Conventional till	POST:	Roundup Ready plots — 32 oz/A Roundup Ultra Max Conventional plots — 2.2 oz/A First Rate, 1 pt/A Basagran, 1 qt/A crop oil
Previous Crop:	Corn		
Variety:	See Results		
Soil test:	pH 6.4, P 32 ppm, K 120 ppm		
Fertilizer:	None	Harvest Date:	November 2, 2002

Methods

All plots were randomized with three replications of each variety. Plots were 30 feet in length and six rows wide. Early Roundup Ready soybeans were of 2.8 to 3.4 relative maturity. Late Roundup Ready Soybeans were of 3.5 to 3.9 relative maturity. The maturity ratings of the conventional soybeans were in a range of 2.7 to 3.9. Harvest estimates were made by weights calculated from combine. Yield averages were adjusted to a standard moisture of 13.0%.

Results

(See table on the next page.)

Roundup Ready Early	Yield (bu/A)
Pioneer 93B36	55.5
Vigoro V332RR	55.0
DeKalb DKB31-52	51.9
LG Seeds C3033RR	51.5
LG Seeds C3429RR	51.4
LG Seeds C3322WRR	50.2
Golden Harvest H2940RR	49.4
Asgrow AG3302	49.2
NK S34-B2	49.1
Ag Venture AV6329RR	49.1
NK S32-G5	48.9
Shur Grow 312RR	48.9
Vigoro V340RR	48.5
Golden Harvest H3243RR	47.9
Ag Venture AV6289RR	47.6
Shur Grow 332RR	47.4
Seed Consultants SC9320	46.5
Steyer 3010	46.2
AGI 30R01	45.9
AGI 7343RR	45.2
DeKalb DKB31-51	44.8
Asgrow AG3401	44.1
Crow's C3315R	44.0
Steyer 3430	43.5
Brodbeck SC3000	43.5
Brodbeck SC3080	43.5
Asgrow AG3201	42.9
Sun Prairie SP3400RR	42.6
Sun Prairie SP2801RR	42.4
HF9670-3-10 (3.0)	42.3
HF9667-2-4 (2.6)	41.3
Sun Prairie SP2902NRR	40.0
Hytest RT346RR	39.7
High	**55.5**
Average	**46.7**
Low	**39.7**
LSD (0.05)	**9.2**

Roundup Ready Late	Yield (bu/A)
DeKalb DKB35-51	56.7
Pioneer 93B72	49.7
Seed Consultants SC9391	48.6
Asgrow AG3703	47.8
Seed Consultants SC9371	46.4
Ag Venture AV 6371RR	46.0
Seed Consultants SC9362	44.6
AGI 7361RR	44.4
Sun Prairie SP3602NRR	44.1
Pioneer 93B53	43.3
Vigoro V372RR	43.2
Garst 3712RR	43.1
Seed Consultants SC9351	42.6
Crow's C3717R	42.6
LG Seeds C3655RR	40.6
AGI 7374	40.6
LG Seeds C3944NRR	40.3
LG Seeds C3767RR	39.2
Golden Harvest H3603RR	38.6
LG Seeds C3996RR	38.1
AGI 7377NRR	37.9
Pioneer 93B68	37.8
Shur Grow 362RR	36.6
DeKalb DKB38-51	36.5
HF9667-2-15 (3.8)	36.5
Pioneer 93B67	36.5
Vigoro V37N3RR	36.1
Steyer 3540	35.5
Sun Prairie SP3702RR	35.4
Hytest RT 3600RR	34.9
Shur Grow 351RR	34.0
Shur Grow 370RR	33.6
Golden Harvest H3994RR	32.4
Ag Venture AV6361RR	30.8
Pioneer 94B13	29.8
Ag Venture AV6350RR	28.6
Shur Grow 360RR	28.3
NK S 35-A6	23.4
Crow's C3915R	21.9
HF9665-2-15 (3.9)	21.2
High	**56.7**
Average	**38.2**
Low	**212**
LSD (0.05)	**17.5**

Conventional	Yield (bu/A)
Sow Right SR390	53.3
LG Seeds C3545	46.3
LG Seeds C3201	45.2
Shur Grow 398	43.8
Sow Right SR350	43.1
Shur Grow 328STS	42.4
Steyer 386	41.8
Vigoro V380	41.3
General	41.1
LG Seeds C3883N	40.4
Shur Grow 392STS	39.5
Dilworth	38.7
Ag Venture AV1398	38.4
Ohio FG3	38.2
Shur Grow 311STS	37.2
Ohio FG1	36.9
Ag Venture AV1329	36.6
Kottman	36.0
Sow Right SR360STS	34.4
Ag Venture AV227	34.3
Stressland	34.1
High	**53.3**
Average	**40.1**
Low	**34.1**
LSD (0.05)	**13.8**

Summary

Seventeen varieties of the early Roundup Ready soybeans were not significantly different from each other with yields ranging from 46.5 to 55.5 bushels per acre. Eighteen late Roundup Ready soybean varieties were not significantly different from each other with yields ranging from 39.2 to 56.7 bushels per acre.

For the conventional soybean plots, 11 varieties were not significantly different in yield from each other with a range of 39.5 to 53.3 bushels per acre.

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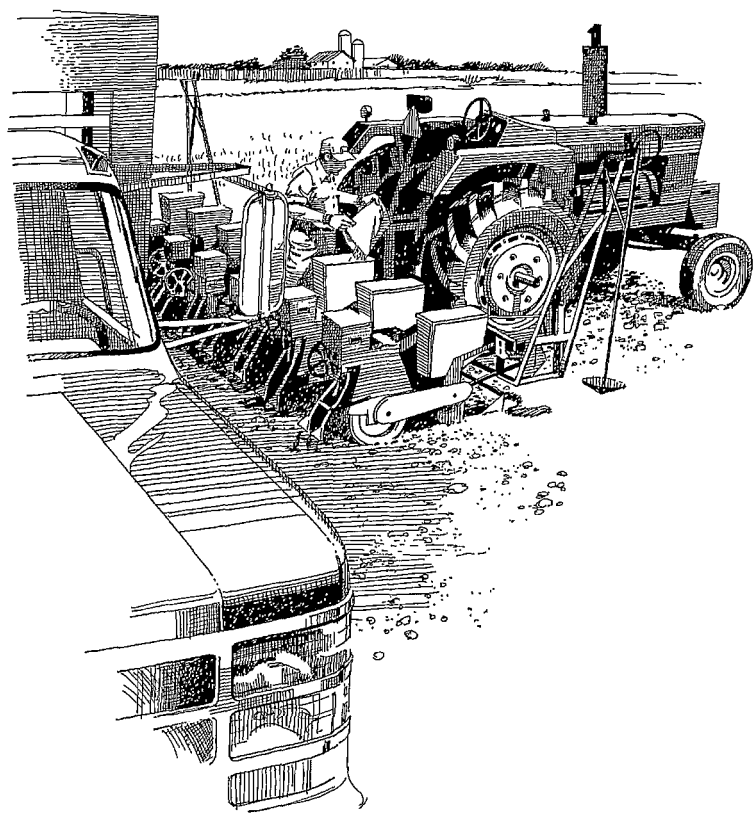
Soybean Seeding Rates



Soybean Seeding Rate Comparison

Alan Sundermeier, Agriculture and Natural Resources Extension Agent

Objective

To evaluate the effect of seeding rate on yield of soybeans.

Background

Cooperator:	Ed and Howard Rosebrook	Soil test:	pH 6.7, P 24 ppm, K 153 ppm
County:	Henry		
Nearest Town:	Deshler	Fertilizer:	None
Drainage:	Tile, subsurface	Planting Date:	May 30, 2002
Soil type:	Hoytville clay	Planting Rate:	225,000 seed/A
Tillage:	No-till	Row Width:	7-inch
Previous Crop:	Corn	Herbicides:	Synchrony STS .3 oz/A, Reflex 1.5 pt/A, Classic 0.5 oz/A
Variety:	Rupp RS2333STS		
		Harvest Date:	September 24, 2002

Methods

Three population rates were used to determine the effect of seeding rate on soybean yields. They were 110,000, 165,000, 220,000 seeds per acre. A Great Plains 15-foot no-till drill was used. The seed used had a germination percentage of 90%. The entries were replicated four times in a randomized complete block design. Individual planted plot size was 30 feet wide by approximately 930 feet in length. A 20-foot wide strip was harvested the length of the plot and weighed using a yield monitor on the combine.

An emerged population count was taken on June 26 at the V2 stage of the soybean by using the hoop method. Harvest population was determined by counting the soybean plants in 3 feet of row for four rows per treatment.

Results

Table 1. Soybean Population and Yield.[a]

Seeding rate	Population growth stage V2	Harvest Population	Yield
(plants/A)	(plants/A)	(plants/A)	(bu/A)
110,000	134,522 a	106,175 a	59.3 a
165,000	179,365 ab	147,010 b	61.8 b
220,000	253,035 b	242,300 bc	62.6 b
LSD (0.05)	97,823	39,096	1.3
F-test	4.6	2.3	1.4

[a] Means followed by the same letter in same column are not significantly different

Summary

Weed control was very good across the seeding rates. Grain moisture at harvest was 12.3%. A timely rain allowed crop yields to be near normal for this area.

This study shows that there can be a significant difference between seeding rates as it pertains to soybean yield. The optimum soybean population count in this study was 147,010 plants/A.

When planting minimum seeding rates, be sure the planting equipment is calibrated and the germination rate of the seed is known.

Acknowledgment

Thanks to Rupp Seed Co. for cooperating in this study.

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Seeding Rates for Roundup Ready Soybeans

Steve D. Ruhl, Agriculture and Natural Resources Extension Agent
Ed Lentz, Extension Agronomy Specialist

Objective

To evaluate the effect of seeding rate on yield of Roundup Ready Soybeans.

Background

Cooperator:	Tom Weiler	Fertilizer:	None
County:	Morrow	Herbicide:	
Nearest Town:	Chesterville	PRE:	Valor 1.25 oz/A
Drainage:	Systematically tiled	POST:	Roundup Ultra Max 26 oz/A
Soil type:	Sleeth silt loam		
Tillage:	Conventional	Planting Date:	May 22
Previous Crop:	Corn	Planting Rate:	See table
Variety:	Pioneer 93B72RR	Row Width:	10-inch
Soil Test:	pH 7.0, P 23 ppm, K 154 ppm	Harvest Date:	October 11

Methods

Three seeding rates were used to determine the effect of seeding rate on yields. They were 120,000, 162,500, and 227,500 seeds per acre. The seed had a germination percentage of 90%. The treatments were replicated four times in a randomized complete block design. Plot size was approximately 4/10 acre. The soybeans were planted in 30-foot wide strips, and a 20-foot wide strip was harvested and weighed using a weigh wagon. Harvest population was calculated by counting plants in 1/1000 of one acre in each plot.

Results

Table 1. Harvest Population and Soybean Yield.[a]

Treatment (seeds/A)	Harvest Population (plants/A)	Yield (bu/A)
120,000	92,000 a	54.4 a
162,500	120,000 b	57.2 a
227,500	171,000 c	56.0 a
LSD (0.05)	17,329	NS
F-test	46.7	1.5

[a] Means followed by the same letter in the same column are not significantly different. NS = Not Significant

Summary

For 2002 the seeding rates did not have a significant effect on yields in this study. Similar results were found the previous year on the same farm with a different variety (Pioneer 93B01RR). The results support other studies indicating soybeans will compensate for thinner stands.

The moisture levels were nearly uniform across the plots. They tested in a narrow range of 11.6% to 11.8%. Thus, yields reported were not adjusted to a standard moisture level.

Acknowledgments

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Relationship Between Seeding Rates and White Mold Development in Soybeans

Glen Arnold, Agriculture and Natural Resources Extension Agent
E. M. Lentz, Extension Agronomy Specialist
Anne Dorrance, State Soybean Pathologist

Objective

To evaluate the effect of seeding rate on white mold development in soybeans.

Background

Cooperator:	Dan Heitzman	Soil test:	pH 6.5, P 40 ppm, K 125 ppm
County:	Putnam		
Nearest Town:	Continental	Fertilizer:	None
Drainage:	Natural	Planting Date:	June 3, 2002
Soil type:	Silty clay loam	Planting Rate:	See below
Tillage:	Chisel plowed / disked in the fall	Row Width:	15-inch
		Herbicides:	Boundary 2 pt / A
Previous Crop:	Clover		Canopy 3.5 oz / A
Variety:	TS 401	Harvest Date:	October 17, 2002

Methods

Experimental design was a randomized complete block with three treatments replicated six times. Treatments were three seeding rates: 110,000; 165,000; and 225,000 seeds per acre. The plots were planted with a White 6100 planter. Individual planted plot size was approximately 1/4 acre. The soybeans were planted in 30-foot wide strips for a length of about 360 feet. Using a Gleaner L-3 combine, a 20-foot wide strip was harvested the length of the plot and weighed using a weigh wagon. Harvest population was estimated by counting soybean plants in four adjacent rows for a length of 50 feet.

Results

Even though the field selected had a history of white mold, environmental conditions were not conducive for disease development. Thus, the results will only discuss the effects of seeding rate on grain yield.

Table 1. Soybean Yield and Harvest Population.[a]

Seeding Rate (seeds/A)	GrainYield (bu/A)	Harvest Population (plants/A)
110,000	60.0 a	95,774 a
165,000	58.9 a	124,349 b
220,000	60.5 a	175,895 c
LSD (0.05)	NS	12,974
F-test	<1	97

[a] Means followed by the same letter in same column are not significantly different

Summary

A uniform stand was achieved for all seeding rates due to adequate rainfall following planting. Drought conditions were not conducive to white mold development. The plot received less than eight inches of rainfall during the growing season. Final harvest populations were statistically different, but grain yields were not statistically different. Thus, according to this trial, seeding rates between 110,000 and 220,000 seeds/A had no effect on yield.

Acknowledgment

The authors would like to thank Dan Heitzman for cooperating in this study.

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Seeding Rate and White Mold Development in Soybeans

Ed Lentz, Extension District Specialist, Agronomy
John Smith, Extension Agent, Agriculture and Natural Resources
Anne Dorrance, Extension State Specialist, Plant Pathology

Objective

To evaluate the effect of seeding rate on white mold development in soybeans.

Background

Cooperator:	Jim Becher	Soil test:	Unavailable
County:	Auglaize	Fertilizer:	None
Nearest Town:	Wapakoneta	Planting Date:	June 4, 2002
Drainage:	Naturally well-drained	Planting Rate:	See treatments
Soil type:	Blount and Pewamo silt loam	Row Width:	7.5-inch
		Herbicides:	Roundup Ultra 1 qt/A + AMS
Tillage:	No till		
Previous Crop:	Corn	Harvest Date:	October 8, 2002
Variety:	Asgrow AG3302		

Methods

Experimental design was a randomized complete block with three treatments replicated five times. Treatments were three seeding rates: 110,000; 165,000; and 220,000 seeds/A. A John Deere 750 Drill was used at planting. Plots were 30 feet wide and 400 feet long. The center of each plot (20 feet wide) was harvested for grain yield. Grain weight was estimated by a weigh wagon. A Dickey John tester was used for grain moisture. Yield was adjusted to 13% moisture. Harvest population was estimated by counting plants from four adjacent rows for 50 feet.

Results

Even though the field has a history of white mold, environmental conditions were not conducive for disease development. Thus, the results only discuss the relationship between grain yield and seeding rate.

Table 1. Soybean Grain, Harvest Moisture, and Population Response to Seeding Rate.[a]

Seeding Rate	Grain Yield	Harvest Moisture	Harvest Population
(seeds/A)	(bu/A)	(%)	(plants/A)
165,000	42.8 a	11.4 a	141,622 b
220,000	42.4 a	11.2 b	169,431 a
110,000	39.8 b	11.2 b	80,359 c
LSD (0.05)	2.0	0.2	18,898
F-test	6.9	3.3	62

[a] Means followed by the same letter within a column are not significantly different.

Discussion and Summary

The yield for the lowest seeding rate was statistically less than the other two treatments. However, the harvest population for the lowest seeding rate was 73% of the target population, whereas the other treatments were approximately 85%. The lack of stand establishment would affect the lowest seeding rate more than other treatments.

The results of this study would suggest that a grower might be able to reduce production costs by reducing seeding rate. Approximately $7/A may be saved by reducing seeding rate 50,000 seeds/A, assuming a 50 lb bag of Roundup Ready Soybeans cost $20, and 3,000 seeds/lb. Estimating cash market price of $5.50 per bushel, the 165,000 seeds/A rate would have resulted in 9 to 10 dollars per acre more profit than the other two seeding rates. Further studies are needed to determine if lower seeding rates might be used for years with larger yields.

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Soybean Seeding Rates in 15-Inch Rows — 1

Jim Lopshire, Agriculture and Natural Resources Extension Agent

Objective

To evaluate the effect of seeding rate on yield for conventional soybeans planted in 15-inch rows.

Background

Cooperator:	Gary and Keith Derck	Herbicide:	
County:	Paulding	PRE: 4/15/02	Boundary - 1.75 pints/A
Nearest Town:	Antwerp		Canopy DF - 21/2 oz/A
Soil Type:	Latty clay	POST: 7/4/02	Select - 5 oz/A
Drainage:	Systematic	Planter:	Kinze 3600
Tillage:	No-Till	Row Spacing:	15 inch
Previous Crop:	Corn	Planting Rate:	See Treatments
Fertilizer:	None Applied	Planting Date:	May 24, 2002
Variety:	Pioneer 9306	Harvest Date:	October 9, 2002

Methods

Three population rates were used to determine the effect of seeding rate on yield. Planting rates selected were 162,000, 180,000, and 220,000 seeds per acre using a Kinze 3600 no-till planter. Treatment rates were based on settings listed in the planter manual. These treatments were replicated four times in a randomized complete block with each individual treatment strip measuring 80 feet wide and 1,665 feet long. A 60-foot wide strip the full length of the field was harvested for each individual treatment. Soybean yield, moisture, and acres harvested were calculated using a calibrated AgLeader GPS Monitoring System. Harvest moisture levels were adjusted to 13% grain moisture level.

Harvest population counts were made at two different locations for each plot. Populations were determined by counting the number of soybean plants in 1/1,000 acre between two adjacent rows for each individual treatment.

Results

Table 1. Plant Population, Moisture and Yield for Seeding Rate Treatments.[a]

Planting Population (seeds/A)	Harvest Population (plants/A)1	Moisture %	Yield (bu/A)
162,000	125,250a	11.7	48.3
180,000	143,750b	11.9	48.4
220,000	173,250c	11.9	50.8
LSD (0.05)	13,539	NS	NS
F-test	38.3	2.7	4.9

[a] Means followed by a different letter in the same column are significantly different.

Summary

The first-year study showed no significant difference in yield means per acre or soybean moisture among the three plant population treatments. Harvest populations were statistically different for the three treatment means. The herbicide program provided excellent weed control for the entire growing season.

Data from this one-year study suggests that the three statistically different population treatments did not produce a significant yield increase among the three treatment populations. Seed cost per acre ranged from $6.88 per acre for the lowest plant setting of 162,000 plants per acre to $9.35 for the highest plant setting of 220,000 plants per acre. This is a savings of $2.47 per acre.

Acknowledgment

The author would like to thank Gary and Keith Derck for their cooperation in this study.

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Soybean Seeding Rates in 15-Inch Rows — 2

Jim Lopshire, Agriculture and Natural Resources Extension Agent

Objective

To evaluate the effect of seeding rate on yield for conventional soybeans planted in 15-inch rows.

Background

Cooperator	Jay Schmidt	Herbicide:	
County:	Paulding	PRE: 4/26/02	2,4-D (12 oz/acre)
Nearest Town:	Payne		Detail (2 pints/acre)
Soil Type:	Hoytville		Sencor (6 oz/acre)
Drainage:	Systematic	POST:	None
Tillage:	No-Till	Planter:	Kinze 2600
Previous Crop	Corn	Row Spacing:	15-inch
Fertilizer:	None Applied	Planting Rate:	See Treatments
Variety:	LG 3201	Planting Date:	June 4, 2002
		Harvest Date:	October 5, 2002

Methods

Three population rates were used to determine the effect of seeding rate on yield. The planting rates selected were 161,350, 182,400, and 219,540 seeds per acre using a Kinze 2600 no-till planter. Treatment rates were based on settings listed in the planter manual. Treatments were replicated four times in a non-randomized complete block. The harvest plots were one acre in size measuring 60 feet wide by 726 feet long. Each strip was weighed using calibrated portable scales, and the yield was adjusted to 13% grain moisture level.

Harvest population was determined by counting the soybean plants in 1/1,000 acre on two corresponding adjacent rows for each individual treatment.

Results

Table 1. Plant Population, Moisture, and Yield for Seeding Rate Treatments.[a]

Planting Population (seeds/A)	Harvest Population (plants/A)	Moisture %	Yield (bu/A)
161,350	111,250a	13.5	50.0
182,400	119,750a	13.0	50.8
219,450	150,500b	13.1	51.7
LSD (0.05)	18,671	NS	NS
F - test	16.2	<1	1.0

[a] Means followed by a different letter in the same column are significantly different.

Summary

The harvest population was less than 70% of the planting population for the three treatments. Populations were not significantly different between two of the three treatment means. There was no significant difference in soybean averages for yield or moisture.

Data from this first-year study suggests that the soybean populations did not produce a significant yield increase among the three populations. Seed cost per acre ranged from $16.74 per acre for the lowest plant setting of 161,350 plants per acre to $22.77 for the highest population setting of 219,450 plants per acre. This is a savings $6.03 per acre.

Acknowledgment

The author would like to thank Jay Schmidt and his father Dick Schmidt for their cooperation in this study.

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Soybean Seeding Rates in 30-Inch Rows

Dennis Baker, Agriculture and Natural Resources Extension Agent
Steve Foster, Agriculture and Natural Resources Extension Agent

Objective

To determine whether there are significant yield differences when seeding rates of soybeans are increased from 110,000 to 165,000 to 220,000 seeds per acre.

Background

Cooperator:	Darke County Farm	Fertilizer:	Broadcast 100 lb/A 0-41-0 and 125 lb/A 0-0-60
County:	Darke County		
Nearest Town:	Greenville	Planting Date:	May 30, 2002
Drainage:	Subsurface	Planting Rate:	See treatment
Soil types:	Miami silt loam and Eldean loam	Row Width:	30-inch
		Herbicides:	
Tillage:	No-till	PRE:	26 oz/A Roundup Ultra Max and 1.4 oz/A Scepter
Previous Crop:	Corn		
Variety:	Cropland 3276		
Soil test:	pH 5.9, P 28 ppm K 150 ppm	POST:	26 oz/A Roundup Ultra Max and 0.2 oz/A First Rate
		Harvest Date:	October 4, 2002

Methods

Soybeans were planted using a Buffalo slot planter with Kinze brush-type seed meter units. The plots were replicated four times with each plot 30 feet wide and approximately 750 feet in length. One stand count was taken approximately three weeks after emergence in each of the four replications of each population to verify differences in seeding rates.

Results

Table 1. Soybean Stand, Moisture, and Yield.[a]

Treatment	Stand Count	Moisture	Yield
(seeds/A)	(plants/A)	(%)	(bu/A)
110,000	93,573 a	12.0	12.4
165,000	138,747 b	12.0	12.0
220,000	157,551 b	12.0	13.7
LSD (0.05)	32,263	NS	NS
F-test	16.0	<1	1.8

[a] Means followed by the same letter in the same column are not significantly different

Summary

There were no significant differences in the yields when comparing three different seeding rates of soybeans planted in 30-inch rows. This was not an exceptionally good year for growing soybeans in our area. Expected yields are usually four to five times greater than what was experienced this year. Due to the extremely dry and hot weather, herbicide efficacy was very low, and the canopy was thin. This resulted in significant weed pressure.

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Seeding Rates for Late-Planted Soybeans

Ed Lentz, Extension District Specialist, Agronomy
Alan Sundermeier, Extension Agent, Agriculture and Natural Resources

Objective

To evaluate the effects of seeding rate on the yield of late-planted soybeans.

Background

Cooperator:	OARDC Northwestern Branch	Fertilizer:	100 lbs. 0-46-0 150 lbs. 0-0-60
County:	Wood	Planting Date:	June 17, 2002
Nearest Town:	Hoytville	Seeding Rate:	See Methods
Drainage:	Systematically tiled	Row Width:	7.5-inch
Soil type:	Hoytville clay	Herbicides:	
Tillage:	Disk	PRE:	3.4 oz/A Canopy SP 16 oz/A 2, 4-D Ester
Previous Crop:	Corn	POST:	26 oz/A Roundup Ultra Max + AMS
Variety:	Pioneer 93B01		
Soil test:	pH 6.5, P 104 ppm K 208 ppm	Harvest Date:	October 9, 2002

Methods

Experimental design was a randomized complete block with four treatments replicated four times. Treatments were four seeding rates — 150,000; 200,000; 250,000; and 300,000 seeds/A. A Great Plains No-Till Drill was used for planting. Drill was calibrated by using a seed counter before planting. Plots were 10 feet wide and 74 feet long. The center 11 rows of each plot were harvested for grain yield. A plot combine scale and moisture sensor was used to estimate grain weight and moisture. Yield was adjusted to 13% moisture. Harvest population was estimated by counting plants from four adjacent rows for 6.5 feet from three areas of each plot.

Results

Table 1. The Soybean Grain Yield, Harvest Moisture, and Harvest Population.[a]

Seeding Rate	Grain Yield	Harvest Moisture	Harvest Population
(seeds/A)	(bu/A)	(%)	(plants/A)
300,000	47.2 a	13.7	272,082 a
250,000	45.8 a	13.2	230,533 b
200,000	43.7 a	12.9	169,772 c
150,000	37.9 b	12.2	124,872 d
LSD (0.05)	5.7	NS	12,873
F-test	5.3	<1	261

[a] Means followed by the same letter in a column are not statistically different

Discussion and Summary

Grain yields were similar for seeding rates 200,000 seeds/A and above. The 150,000 treatment had significantly lower yields than other treatments. Harvest moisture was not affected by seeding rate. Significant separation was observed for harvest populations among treatments. Conditions were good for stand establishment as evidenced by the stand being 88% of the target-seeding rate across treatments.

Higher seeding rates are generally recommended for later plantings. This study would suggest that 200,000 seeds/A would be adequate for optimal yields under good growing conditions for late plantings. Reducing seeding rate 50,000 seeds/A, assuming a 50-lb bag of Roundup Ready Soybeans cost $20, and 3,000 seeds/lb, may save approximately $7/A.

Further studies are required to determine which seeding rate would be adequate for more stressful conditions during emergence.

Acknowledgment

The authors of this report are grateful for the support provided by the OARDC staff at the Northwestern Branch.

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Wheat Management

Spring Nitrogen Application Times for Wheat

Ed Lentz, Extension District Specialist, Agronomy

Objective

To evaluate the effects that spring nitrogen application time may have on wheat yields.

Background

Cooperator:	OARDC Northwestern Branch	Soil test:	pH 6.3, P 45 ppm, K 177 ppm
County:	Wood	Fertilizer:	0-0-60 = 100 lb / A
Nearest Town:	Hoytville		0-46-0 = 50 lb / A
Drainage:	Tiled	Planting Date:	October 1, 2001
Soil type:	Hoytville clay	Planting Rate:	160 lb / A
Tillage:	No till	Row Width:	7.5-inch
Previous Crop:	Soybeans	Herbicides:	4 oz. Stinger
Variety:	Hopewell	Harvest Date:	July 8, 2002

Methods

Experimental design was a randomized complete block with four treatments replicated four times. Treatments were four nitrogen application times — late February, first greenup, initial stem elongation, and late stem elongation. A Great Plains No-Till Drill was used for seeding. In the fall, 30 pounds of nitrogen was surface applied as urea-ammonium nitrate (28%). Seventy pounds of nitrogen (urea) was surfaced applied by a Gandy spreader in the spring for each treatment. Plots were 10 feet wide and 70 feet long. The center 11 rows were harvested for grain yield. A combine scale estimated grain weight. Grain moisture was approximately 11%. At flowering, measurements from 30 flag leaves were averaged for each plot by a Minolta Spad meter to estimate nitrogen uptake. Head number was estimated by counting spikes in three-foot sections from three areas in each plot.

Results

Table 1. Wheat Grain Yield, Spad Meter Readings, and Head Number Response to Application Time of Spring Nitrogen.[a]

Spring Nitrogen Application	Grain Yield	Spad Meter At Flowering	Heads
	(bu/A)		(spikes/ft2)
Early stem elongation	82.8 a	44.8 b	66 a
Late February	73.3 b	41.0 c	66 a
Greenup	68.1 c	39.8 c	61 b
Late stem elongation	62.6 d	48.0 a	57 b
LSD (0.05)	3.6	3.0	4.3
F-test	58.7	15.9	10.3

[a] Means followed by the same letter within a column are not significantly different.

Discussion and Summary

Time of spring nitrogen had a significant effect on grain yield. Yields were the largest for applications at initial stem elongation and the smallest for late stem elongation. Spad meter values were higher for initial stem elongation than late February and greenup, suggesting nitrogen loss from these earlier applications. Even though the late stem elongation time had the highest meter values, it was too late to be utilized by the crop as evident by the fewer number of heads. Yields for greenup treatment would not have been expected to be lower than the late February application. The lower meter value and fewer heads than the late February application would suggest possible nitrogen loss, but the type of loss is beyond the scope of this experiment.

April weather conditions were conducive for nitrogen loss in 2002 (wetter and warmer than normal). Late February and greenup applications may have been early enough that ammonium-nitrogen had converted to nitrate-nitrogen and was lost during the wet and warm April. In other years, yields probably would not be as different among these application times. Late February may be as good as greenup for nitrogen applications. Nitrogen applications after initial stem elongation may be too late for adequate utilization by the crop.

Acknowledgment

The author of this report is grateful for the support provided by the OARDC staff at the Northwestern Branch.

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Spring-Applied Nitrogen Sources for Wheat

Ed Lentz, Extension District Specialist, Agronomy

Objective

To evaluate the relationship between nitrogen source and wheat yields.

Background

Cooperator:	OARDC Northwestern Branch	Fertilizer:	Broadcast prior to planting 0-0-60 = 100 lb/A 0-46-0 = 50 lb/A
County:	Wood		
Nearest Town:	Hoytville	Planting Date:	October 1, 2001
Drainage:	Systematic Tile	Planting Rate:	2.3 million seeds/A
Soil type:	Hoytville clay	Row Width:	7.5-inch
Tillage:	No till	Herbicides:	Stinger 4oz/A
Previous Crop:	Soybeans	Harvest Date:	July 8, 2002
Variety:	Hopewell		
Soil test:	pH 6.3, P 45 ppm, K 177 ppm		

Methods

Experimental design was a randomized complete block with five treatments replicated four times. Treatments were three N sources (ammonium sulfate, urea, and urea-ammonium nitrate) and two checks. A Great Plains No-Till Drill was used for seeding. Thirty pounds of nitrogen was surface applied in the fall as urea-ammonium nitrate (28% N). In the spring, 70 lb/A of nitrogen was surfaced applied by a Gandy spreader for ammonium sulfate and urea, and flat fan nozzles were used for urea-ammonium nitrate. One check received zero nitrogen in the spring, the other received 100 lb/A of nitrogen applied as 28% N. Plots were 10 feet wide and 70 feet long. The center 11 rows were harvested for grain yield. A combine scale measured grain weight. Grain moisture was approximately 11%. Minolta Spad meter readings from 30 flag leaves were averaged at flowering for each plot to estimate nitrogen uptake. Head number was estimated by counting heads in a single row for three feet from three areas in each plot.

Results

Table 1. Wheat Grain Yield, Spad Meter Readings, and Head Counts.[a]

Spring Nitrogen Source	Grain Yield	Spad Meter Reading	Heads
	(bu/A)		(heads/ft^2)
Ammonium Sulfate	77.0 a	42.2 a	65 a
100 lb. N check	75.3 a	39.8 ab	64 a
Urea	68.0 b	39.8 ab	61 ab
28%	66.7 b	38.6 b	57 b
Zero N check	54.7 c	34.1 c	46 c
LSD (0.05)	5.0	3.1	6.5
F-test	29.8	8.7	13.1

[a] Means followed by the same letter in same column are not significantly different

Discussion and Summary

Grain yields for ammonium sulfate were approximately 10 bu/A larger than the other two N sources and were similar to the 100 lb/A N check that received 30 lb/A more of N. Yields were similar for urea and 28%. Plants receiving ammonium sulfate had taken up significantly more N (meter value) and had more heads/ft^2 than the 28% treatment. However, N uptake and number of heads were similar for ammonium sulfate and urea.

Nitrogen losses may account for the differences among N sources, particularly since the high N check was equal to ammonium sulfate. If N losses occurred, 28% would have been affected the most, then urea, and ammonium sulfate the least. Nitrogen losses were more likely because of the abnormally warmer fall and winter and the month of April. Sulfur may have also contributed some to the larger yield of ammonium sulfate, but could not be quantified in the parameters of this experiment. Approximately 70 lb of sulfur were applied in the ammonium sulfate treatments, more than most growers use in the area. In this study, ammonium sulfate as a nitrogen source would cost approximately \$31 (44¢/lb N) and the urea treatment would cost approximately \$14.7 (21¢/lb N). The cost of adding more N (as for the 100 lb 28% check) would be approximately \$23 (23¢/lb N). Economically, increasing the N rate for 28%, and probably urea, would have been more cost effective than ammonium sulfate.

Further research would be required to see if a blend of ammonium sulfate and urea would provide similar yields to ammonium sulfate alone, which would lower the cost of an ammonium sulfate program.

Acknowledgment

The author of this report is grateful for the support provided by the OARDC staff at the Northwestern Branch.

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Spring-Applied Nitrogen Rates for Wheat

Ed Lentz, Extension District Specialist, Agronomy

Objective

To evaluate the relationship between nitrogen rate and wheat yields.

Background

Cooperator:	OARDC Vegetable Farm	Fertilizer:	broadcast prior to planting 0-0-60 = 150 lb / A; 18-46-0 = 150 lb / A
County:	Sandusky		
Nearest Town:	Fremont		
Drainage:	Systematically tiled	Planting Date:	October 3, 2001
Soil type:	Hoytville silty clay loam	Planting Rate:	130 lb / A
Tillage:	No-till	Row Width:	7.5-inch
Previous Crop:	Soybeans	Herbicides:	None
Variety:	Hopewell	Harvest Date:	July 15, 2002
Soil test:	pH 6.3, P 50 ppm, K = 143 ppm		

Methods

Experimental design was a randomized complete block with seven treatments replicated four times. Treatments were seven nitrogen rates — 0, 20, 40, 60, 80, 100, and 120 pounds of nitrogen / A. Urea was surface applied from a Gandy spreader for all treatments. All plots received 20 pounds of nitrogen from diammonium phosphate in fall 2001. A John Deere 1550 Drill was used at planting. Plots were 10 feet wide and 70 feet long. The center five feet was harvested for grain yield. A combine scale and a Dickey John tester estimated grain weight and moisture, respectively. Yield was adjusted to 14% moisture. Minolta Spad meter readings from 30 flag leaves were averaged at flowering for each plot to estimate nitrogen uptake. Head number was estimated by counting heads in a single row for three feet from three areas in each plot.

Results

Table 1. Wheat Grain Yield, Spad Meter Readings, and Head Counts.[a]

Spring N Rate	Grain Yield	Harvest Moisture	Spad Meter Reading	Heads
(lbs/A)	(bu/A)	(%)		(heads/ft^2)
0	48.8 a	11.3	34.9 a	55 a
20	54.2 a	11.7	36.9 ab	50 a
40	64.4 b	11.2	38.7 bc	56 a
60	67.7 bc	11.4	39.8 cd	57 a
80	73.3 c	11.5	42.0 de	66 b
100	80.5 d	11.5	43.1 e	69 b
120	83.5 d	11.4	43.6 e	66 b
LSD (0.05)	7.0	NS	2.4	8.0
F-test	29.6	<1	15.7	7.0

[a] Means followed by the same letter in the same column are not significantly different.

Discussion and Summary

Yields increased with increasing nitrogen rate until the 100-lb treatment. Spad meter values showed that nitrogen uptake increased with greater nitrogen rates until the 80 to 100 lb treatments. Treatments receiving less than 80 lb of nitrogen/A had fewer heads, which may partially explain some of the lower grain yields with lower rates of nitrogen. Harvest moisture was not affected by nitrogen rate.

These results show that nitrogen rate may affect yields, nitrogen uptake, and head numbers. In general, yields increased until the 100-lb treatment. Nitrogen utilization is highly dependent upon the year. This study may explain what happened in 2002 but may not be a good predictor for future years. Nitrogen rate studies over many years and locations would be required before a general recommendation could be made.

Acknowledgment

The author of this report is grateful for the support provided by the OARDC staff at the Vegetable Branch.

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Split Spring Nitrogen Applications in Wheat

Ed Lentz, Extension District Specialist, Agronomy

Objective

To evaluate the relationship between nitrogen rate and wheat yields.

Background

Cooperator:	OARDC Vegetable Farm	Soil test:	pH 6.3, P 50 ppm, K 143 ppm
County:	Sandusky		
Nearest Town:	Fremont	Fertilizer:	0-0-60 = 150 lbs/A
Drainage:	Tiled		18-46-0 = 150 lbs/A
Soil type:	Hoytville silty clay loam	Planting Date:	October 3, 2001
Tillage:	No-till	Planting Rate:	130 lb/A
Previous Crop:	Soybeans	Row Width:	7.5-inch
Variety:	Hopewell	Herbicides:	None
		Harvest Date:	July 15, 2002

Methods

Experimental design was a randomized complete block with five treatments replicated four times. Treatments were three single spring applications (80, 100, and 120 lb of nitrogen/A) at greenup; a single application at initial stem elongation (80 lb of nitrogen/A), and a split application (20 lb of nitrogen applied at greenup and 60 lb of nitrogen applied at initial stem elongation). Nitrogen treatments were applied as urea from a Gandy spreader. All plots received 20 lb of nitrogen from diammonium phosphate in Fall 2001. A John Deere 1550 Drill was used at planting. Plots were 10 feet wide and 70 feet long. The center five feet was harvested for grain yield. A combine scale and a Dickey John tester estimated grain weight and moisture, respectively. Yield was adjusted to 14% moisture. A Minolta Spad meter estimated nitrogen uptake at initial stem elongation and flowering, from 30 flag leaves and top collared leaves per plot, respectively. Head number was estimated by counting spikes in three-foot sections from three areas in each plot.

Results

The average wheat grain yield and other agronomic traits response to split nitrogen applications are given in Table 1.

Table 1. Average Wheat Grain Yield and Other Agronomic Traits Response to Split Nitrogen Applications.

Spring N Rate	Grain Yield	Harvest Moisture	Spad Meter Flowering	Spad Meter Initial Jointing	Heads
(lbs/A)	(bu/A)	(%)			(spikes/ft2)
0/80 split	89.8 a	11.7 a	45.0 a	38.1 b	62
20/60 split	85.2 ab	11.0 b	42.1 b	40.8 b	65
120	83.5 ab	11.4 ab	43.6 ab	46.0 a	66
100	80.5 bc	11.5 ab	43.1 ab	46.2 a	69
80	73.3 c	11.5 ab	42.0 b	46.0 a	66
LSD (0.05)	9.0	0.6	2.2	3.4	NS
F-test	4.4	1.8	2.8	11.3	<1

[a] Means followed by the same letter in a column are not statistically different.

Discussion and Summary

Applying 20 lb of nitrogen at greenup followed by 60 lb of nitrogen at initial stem elongation had larger yields than applying 80 lb of nitrogen/A at greenup. This treatment was as efficient as applying 100 lb of nitrogen at greenup. However, the largest yield was obtained by delaying spring application until initial stem elongation, and it was as efficient as applying 120 lb of nitrogen/A at greenup. The two initial elongation treatments had significantly lower nitrogen uptake at initial stem elongation (Spad meter values) than the greenup alone treatments, but the nitrogen applied as a starter in the fall and any residual soil nitrogen prevented a significant reduction in head number. Spad meter values at flowering could not explain grain yield differences. Because head numbers were similar, yield differences between the split and single application may be attributed to seeds per head or larger kernels, which were not measured in this study.

Producers prefer a split system to reduce the chance of yield reduction in nitrogen loss years. Generally, producers apply most of their nitrogen at greenup and a smaller amount at initial stem elongation in a split program. This study would suggest that the smaller amount should be applied at greenup and the larger amount at initial stem elongation. The biggest disadvantage of two applications in the spring would be the cost of the second application, which may negate any yield advantage.

Acknowledgment

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Evaluation of Nitrogen Rate and Sulfur Topdress in Wheat

Andy Kleinschmidt, Extension Agriculture and Natural Resources Agent
Gary Prill, Extension Associate, Farm Focus/Research Coordinator

Objectives

To evaluate the yield response of wheat to two different nitrogen topdress rates and the addition of sulfur in a spring topdress application. Farmers typically apply 90 to 100 pounds of nitrogen in a topdress application in the spring and often don't use previous nitrogen credits. This study will try to determine if a lower rate of topdress will provide the same yields, and if the addition of sulfur will help with nitrogen utilization.

Background

Cooperator:	Marsh Foundation/ Farm Focus	Fertilizer:	320 lb/A 9-25-19 broadcast at planting; variable topdress (see Methods)
County:	Van Wert		
Nearest Town:	Van Wert	POST (April 17):	1 pt/A MCPA
Soil Type:	Hoytville silty clay loam	Insecticide:	none applied
Drainage:	Tile	Variety:	Wellman 9910
Previous Crop:	Soybeans	Row Width:	7.5 inch
Tillage:	No-till	Planting Rate:	166 lb/A
Soil Test (2002): Rep. 1 and 2	pH 6.2, P 33 ppm K 137 ppm	Planting Date:	October 30, 2001
		Harvest Date:	July 8, 2002 (Rep. 1 and 2) July 9, 2002 (Rep. 3)
Soil Test (2002): Rep. 3	pH 6.5, P 85 ppm K 249 ppm		

Methods

This study was set up with two different nitrogen topdress rates with and without sulfur for a total of four treatments. The treatments are 75 lb/A nitrogen, 75 lb/A nitrogen with 9.4 lb/A sulfur, 100 lb/A nitrogen, and 100 lb/A nitrogen with 12.5 lb/A sulfur. The straight nitrogen treatments were applied using 28-0-0 liquid fertilizer, and the treatments with sulfur were applied using 24-0-0-3 liquid fertilizer. There are three replications of each treatment set up in a complete randomized block design. Two replications are in one field and the third replication is in a second field adjacent to the first field with similar soil type and fertility. The study was planted using a John Deere 750 no-till drill. Plot size is 75 feet wide by 900 feet minimum length.

Harvest populations (July 8) were estimated by counting the number of wheat heads in a one-foot section at 10 different locations in each individual plot. The average of the number of heads counted per one foot was converted to heads per square foot. The center 56 feet of each plot was harvested with a John Deere 6620 combine. Each har-

vested plot was weighed by a calibrated weigh wagon, and moisture was determined using a Dickey John calibrated moisture meter. Yields reported in this study have been adjusted to 13.5% moisture standard.

Results

Table 1. Harvest Population, Moisture, and Yield.[a]

Treatment	Harvest Population	Moisture	Yield
	(heads / ft2)	(%)	(bu / A)
100 lb. / A nitrogen + 12.5 lb. / A sulfur	64.0 a	12.7	83.2 a
100 lb. / A nitrogen	55.0 b	12.7	79.4 ab
75 lb. / A nitrogen + 9.4 lb. / A sulfur	58.0 b	12.8	75.8 bc
75 lb. / A nitrogen	54.3 b	12.9	71.7 c
LSD (0.05)	5.1	NS	4.1
F-test	9.1	<1	17.0

[a] Means followed by the same letter in the same column are not significantly different.
NS = not significant

Summary

Results from this one-year study indicate that the addition of 25 lb / A nitrogen significantly increased yields when independently comparing the two nitrogen rates with sulfur and the two nitrogen rates without sulfur. It has been suggested that sulfur added to the nitrogen application increases the efficiency of nitrogen. Although the addition of sulfur may have possibly helped with nitrogen utilization, the addition of sulfur at equivalent nitrogen rates did not significantly improve yields in this study.

According to the *Tri-State Fertilizer Recommendation for Corn, Soybeans, Wheat, and Alfalfa* (Extension Bulletin E-2567, Rep. August 1996), no accurate soil test exists for sulfur at this time. The decision to apply sulfur should be based on the following criteria and observations — low organic matter, sandy soils, and visual symptoms such as a yellow color in the presence of adequate nitrogen. A plant analysis is the best diagnostic tool for confirming sulfur availability.

Acknowledgment

The authors express appreciation to Dan Recker, Ohio City Mercer Landmark, for his cooperation and technical assistance with this study.

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Three-Year Summary of Effect of Modified Relay Intercropping (MRI) on Wheat Yield in 15-Inch Rows

Dr. Steve Prochaska, Extension Agriculture and Natural Resources Agent

Objective

To evaluate the effect of Modified Relay Intercropping (MRI) on wheat yield in a 15-inch-row spacing

Background (2002)

Test Site:	Ohio State University Unger Farm	Soil test:	pH 5.8, P 21 ppm, K 163 ppm
County:	Crawford	Fertilizer:	127-69-60 actual NPK applied per acre
Soil type:	Pewamo clay loam and Blount silt loam	Planting date:	October 2, 2001
Tillage:	Disk	Planting rate:	120 lb/A
Previous crop:	Soybeans	Row width:	15 inch
Variety:	See table	Herbicide:	2,4-D 1 pt/A
		Harvest date:	July 8, 2002

Methods

A completely randomized design with six replications in small plots (5.5 x 50 feet) in each of three years was used to evaluate the effect of MRI on wheat yield. Treatments were 15-inch-row wheat and 15-inch-row wheat interseeded with soybeans. Wheat and soybeans were planted with a three-point hitch mounted tool bar planter equipped with sunflower openers. Soybeans were interseeded June 5, 2002, with the same planter used to seed wheat. Wheat harvest was completed in late June or early July with a research plot combine.

Results

Table 1. Three Years of 15-Inch Row Spacing Wheat Yields and Summary.

	Not Intercroppped	Intercropped	Difference	LSD (0.05)
Year and Variety	(bu/A)	(bu/A)	(bu/A)	(bu/A)
2000 I9824	70.8	62.0	8.8	3.4
2001 Agra 962	79.2	68.0	11.2	4.2
2002 Agra 962	76.8	71.4	5.4	3.4
Average	75.6	67.1	8.5	

Summary

What level of wheat yield can be expected from wheat grown in wide rows that is also intercropped? This question is important to producers in wheat/soybean double crop systems. In each of the three years of this study, wheat grown in a modified relay intercrop system yielded significantly less than wheat grown in the same spacing conventionally.

Interseeded wheat produced 8.5 bu/A lower yield than non-interseeded wheat when both were grown in rows spaced 15 inches apart.

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Three-Year Summary of Effect of Row Width on Wheat Yield

Dr. Steve Prochaska, Extension Agriculture and Natural Resources Agent

Objective

To compare wheat yields grown at 7.5 and 15-inch row widths.

Background (2002)

Test Site:	Ohio State University Unger Farm	Soil test:	pH 5.8, P 21 ppm, K 163 ppm
County:	Crawford	Fertilizer:	127-69-60 actual NPK applied per acre
Soil type:	Pewamo clay loam and Blount silt loam	Planting date:	October 2, 2001
Tillage:	Disk	Planting rate:	120 lb/A
Previous crop:	Soybeans	Row width:	7.5 and 15 inch
Variety:	See table	Herbicide:	2,4-D 1 pt/A
		Harvest date:	July 8, 2002

Methods

A completely randomized design with six replications in small plots (5.5 x 50 feet) in each of three years was used to evaluate the effect of row width on wheat yield. Treatments were 7.5 and 15-inch row wheat. Wheat was planted with a three-point hitch-mounted tool-bar planter equipped with sunflower openers. Wheat harvest was done with a small plot combine.

Results

Table 1. Effect of Row Spacing on Wheat Yield in Crawford County, Ohio, 2000 to 2002.

	7.5-inch rows	15-inch rows	F-test	LSD (0.05)
Year and Variety	(bu/A)	(bu/A)		(bu/A)
2000 I9824	72.3	70.8	<1	NS
2001 Agra 962	86.7	79.2	14.5	4.4
2002 Agra 962	85.1	76.8	28.3	3.5
Average	81.5	75.6		

Summary

What level of wheat yield can be expected from wheat grown in 15-inch rows vs. the row spacing of 7.5 inches? With the new technology of polymer-coated soybeans, this question is important to producers evaluating the profitability of such systems as modified relay intercropping. In the first year of this study, the yield of wheat grown in two different row widths was not significantly different. In the second and third years, yield was significantly different with higher yields with the narrower row wheat planting. When comparing the two treatments over the three-year period, yields were not significantly different.

The yield difference over the three years varied from 2 to 7.5 bu / A. This result was consistent with work done by Beuerlein *et al. (Profitable Wheat Management,* Extension Bulletin 811, page 18) on the effect of row spacing on wheat yield in Ohio.

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Tillage

Corn Tillage System Comparison

Alan Sundermeier, Agriculture and Natural Resources Extension Agent
Matt Davis, OARDC NW Branch Manager

Objective

To evaluate the effect of tillage systems on yield of corn.

Background

Cooperator:	NW Branch	Soil test:	pH 5.9, P 42 ppm
County:	Wood		K 189 ppm
Nearest Town:	Deshler	Fertilizer:	See Methods
Drainage:	Tile, well-drained	Planting Date:	May 29, 2002
Soil type:	Hoytville, clay	Planting Rate:	30,000 seed/acre
Tillage:	See Methods	Row Width:	30-inch
Previous Crop:	soybeans	Herbicides:	Harness Extra 2.4 qt/A,
Variety:	Pioneer 34B24		Atrazine 1 pt/A,
			Roundup 26 oz/A
		Harvest Date:	October 23, 2002

Methods

The entries were replicated four times in a randomized complete block design. Plot size was 10 x 70 feet, each entry. After the 2001 soybean harvest, the following fertilizer was applied: 100 lbs/A of 0-46-0 and 150 lbs/A of 0-0-60. On 11-05-01, fall tillage was performed on the soybean residue: strip-tillage, Aer-Way and Harrow, Zone-builder, and disk and field cultivator (stale seedbed). The remaining entry was untouched for no-till. No further tillage was done, and corn was directly planted into soil as is in the spring (no spring tillage). At corn planting, 20 lbs/A of 46-0-0 was placed 2 x 2. Sidedress application of 43 gal/A of 28-0-0 was coulter injected in June. Harvest data were collected from the center two rows.

Results

Table 1. Corn Yield by Tillage System.[a]

Tillage System	Corn Yield
	Bu/ac
Zone builder	63.1 a
Aerway	66.3 a
No-till	68.6 ab
Strip till	71.4 ab
Disk,field cultivator	79.5 b
LSD (0.05)	12.5
F-test	1.5

[a] Means followed by the same letter in same column are not significantly different.

Table 2. Temperature and Rainfall Averages for 2002 and 30-Year Average (Normal), Northwestern Branch, Ohio Agricultural and Research Development Center, Custar, Ohio.

Date	Temperature		Rainfall	
	2002	Normal	2002	Normal
	°F		inches	
January	32.8	24.2	1.90	1.82
February	33.2	27.2	2.61	1.61
March	35.6	36.7	2.82	2.51
April	50.9	48.9	3.76	3.25
May 1-15	53.7	56.9	3.15	1.47
16-31	57.4	62.6	1.50	1.97
June 1-15	68.3	67.8	1.98	1.91
16-30	75.2	71.2	0.15	1.63
July 1-15	75.3	72.6	0.03	1.75
16-31	76.7	73.0	3.25	2.04
Aug 1-15	70.4	71.1	0.00	1.51
16-31	67.0	70.1	2.92	1.65
September	67.7	64.0	3.68	2.71
October	50.2	52.5	1.18	2.05
Total	—	—	25.68	25.64

Summary

Yields were extremely low due to late planting (May 29) followed by a lack of rainfall during the summer growing season. For that reason, no meaningful conclusions should be derived comparing the tillage systems.

Zone builder tillage (subsoiler) may have allowed the soil to dry out more than the other systems due to its 12- to 18-inch deep shank penetration, thus resulting in lower yields. This was consistent with results from other research at the same site in 2002.

Disking and field cultivation in the fall was in the highest-yielding group of treatments, but it also had the least amount of surface residue for soil protection from erosion.

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Deep Ripping for Corn Production

Gary Wilson, Extension Agent, Agriculture and Natural Resources
Ed Lentz, Extension District Specialist, Agronomy

Objective

To evaluate the effects of deep ripping on corn yields.

Background

Cooperator:	Jim Kuhlman	Fertilizer:	Broadcast and incorporated May 12
County:	Hancock		300 lb / A 46-0-0
Nearest Town:	Findlay		300 lb / A 9-23-30
Drainage:	Naturally poorly-drained		
Soil type:	Millgrove / Colwood silt loam	Planting Date:	May 14, 2002
		Planting Rate:	29,000 seeds / A
Tillage:	Conventional till	Row Width:	30-inch
Previous Crop:	Soybeans	Herbicides:	24 oz / A Liberty
Hybrid:	NK 45A6	Harvest Date:	October 31, 2002
Soil test:	none		

Methods

Experimental design was a randomized complete block with three treatments replicated four times. Treatments were fall deep ripping at 8 and 14 inches by an Unverferth In-line Ripper and a zero check followed by conventional practices in the spring. Plots were 40 feet wide and 1,530 feet long. Plot yields were measured with a weigh wagon. Yield was adjusted to 15% moisture. Harvest population was estimated by counting plants from 17.4-foot sections of two center rows per plot.

Results

Table 1. Treatment Means for Yield, Moisture, and Population.[a]

Deep Ripping Depth	Grain Yield	Harvest Moisture	Harvest Population
(inches)	(bu / A)	(%)	(plants / A)
14	63.1 a	17.3 a	18,750 a
8	61.9 ab	17.4 a	19,750 a
0	55.9 b	17.6 a	21,125 a
LSD (0.05)	6.7	NS	NS
F-test	18.8	<1	<1

[a] Means followed by the same letter within a column are not significantly different.

Discussion and Summary

Deep ripping had larger yields than the zero check at the 14-inch depth. The 8-inch depth was similar to the zero check. However, yields overall were greatly reduced by abnormally hot and dry conditions during the growing season. Normally yields would be between 175 and 200 bu/A. No differences were detected for harvest moisture and population. Populations were lower than most years, which also may have contributed to lower yields. Conditions were cold and wet during planting which may have caused the stand reduction.

Deep ripping at 14 inches in the fall may be a benefit in stress years. This benefit may have been the result of improved soil conditions for root development. However, yields were so low that conclusive statements should not be made until further research has been completed from a more normal growing season.

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Strip Tillage vs. Fall Chisel Effects on Corn Yield

Steve D. Ruhl, Agriculture and Natural Resources Extension Agent

Objective

Future Farm Bills may have more conservation compliance associated with payments. Strip tillage would assist in preventing soil erosion and conserving carbon in the soil. To be adopted, it must also be productive relative to existing practices. The objective of this study is to evaluate the effect of strip tillage on corn yields compared to the use of fall chiseled tillage.

Background

Cooperator:	County Commissioners	Fertilizer:	120 lbs/A of N (20 gal/A of 28% at planting and at sidedress)
County:	Morrow		
Nearest town:	Mt. Gilead		
Drainage:	Random tiled	Herbicide:	
Soil type:	Centerburg silt loam	PRE	3 qt/A Degree Xtra (plus Gramoxone 1 qt/A on strips)
Tillage:	Strip tillage and fall chisel		
Previous Crop:	Soybeans	POST	Distinct 4 oz/A
Variety:	DKC 60-08	Planting Date:	June 1
Soil Test:	pH 7.0, P 44 ppm, K 90 ppm	Planting Rate:	26,000 seeds/A
		Row Width:	30-inch
		Harvest Date:	November 18, 2002

Methods

The plot was laid out in alternating strips with five replications. Each individual treatment was 12 rows wide and approximately 3/4 acre in size. The entire area was harvested and weighed using a weigh wagon. The strips and chisel plow areas were completed during November. The strips were developed using a Yetter Strip Till Tool. The six-row mounted unit was pulled at 4 to 5 mph using a 135 hp tractor. The strips were 11-inches wide. The mole knife was running 7-inches deep, and the strips were 5-inches tall in the fall. The strips were the same height as the adjoining soil in the spring.

Results

Table 1. Corn Population and Yields.[a]

Treatment	Population	Yield
	plants/A	bu/A
Strip tillage	21,580 a	45.9 a
Fall chisel	23,380 b	58.1 b
LSD (0.05)	1,626	7.9
F test	9.4	18.1

[a] Means followed by the same letter in the same column are not significantly different.

Summary

The 2002 crop year was a poor one for tillage comparisons. We had a very wet spring, which prevented planting until June 1. The strips built in the previous fall were completely settled down, and weeds made it difficult to keep the planter on the strips. The strips were void of residue, which was the only way to determine where the strips had been built. The wet spring was followed by a very dry summer.

Our plot design using alternating strips was not the best choice. We measured areas using tapes and flags and should have used a completely randomized block design for our plot layout. In future years we will mark the whole field with the strip till tool using the markers and leave the tool in the transport position in the areas we want to chisel.

This year's plot was more of a comparison of no-till vs. chisel. We did achieve a higher population and yield on the chisel areas. Due to our plot design and weather problems in 2002, this study will be repeated in future years.

Acknowledgment

The author would like to thank Monsanto for the seed, herbicide donation, and the use of the Yetter Strip Till Tool. Thanks are also extended to the Morrow County Commissioners, Tom Weiler, Bob Barker, and Dan Barker for their assistance in this study.

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Comparison of Strip-Tillage and Conventional Tillage in Corn Production

Dr. Steve Prochaska, Steve Ruhl, Mark Koenig, Gary Wilson, Andy Kleinschmidt, Jim O'Brien, Agriculture and Natural Resources Extension Agents
Gary Prill, Extension Associate

Objective

To evaluate the effect on corn of yield, test weight, and moisture of fall strip-tillage compared to fall conventional tillage.

Background

	Crawford	Hancock	Fayette	Morrow	Sandusky	Van Wert
Soil Types	Blount/Pewamo	Hoytville	Crosby/ Brookston	Centerburg	Kibbie Sand and Spinks	Hoytville
Drainage	Randomly tiled	Randomly tiled	Systematic	Randomly tiled	Systematic	Systematic
Location	Chuck Smith farm	Duane Stateler farm	Fayette Co. farm	Morrow Co. farm	Steve Lindsay farm	Marsh farm
Plot Size	0.5 acre	0.57 acre	0.17	0.75 acres	0.5 acre	1.65 acre
Strip Tillage Date	11/9/01	11/15/01	m/d	11/5/01	10/31/01	11/14/01
Strip Tillage Implement	Remlinger	Yetter	Yetter	Yetter	Yetter	RandG Trailblazer
Conventional Tillage	11/17/01	11/15/01	m/d	11/14/01	11/1/01	11/16/01
Conventional Tillage Equipment	Disk chisled	m/d	DMI chisel plow, harrow	Fall chisel/field cultivate	Chisel plow/ field cultivate	M&W Earth-master
Depth of Strip Tillage (11/19/01)	7"	m/d	7"	7"	8"	8.2"
Width of Strip Tillage (11/19/01)	13"	m/d	m/d	11"	9.5"	9.7"
Height of Strip Tilled Berm (Fall)	3.6"	m/d	3.1"	4"	3.25"	3.2"

Height of Strip Till After Planting	0"	0"	0"	0"	0"	0"
Planted	5/27/02	5/22/02	5/5/02	6/1/02	4/19/02	5/23/02
Seeds/A	30,500	m/d	30,100	26,000	33,000	29,120
Harvest Date	10/19/02	10/18/02	10/3/02	11/18/02	10/22/02	10/9/02
Planter	International Cyclone	Kinze	John Deere 7000	John Deere 7000	John Deere 7200	John Deere 7000
Corn Hybrid	DKC 60-08	DKC 60-08	SC 1140	DKC 60-08	DKC 60-08	DKC 60-08
Herbicide	3 qt/A Degree Extra + .25 pt/A Banvel (post)	3 qt/A Degree Extra	3 qt/A Degree Extra + 2 oz Distinct (post)	3 qt/A Degree Extra	3 qt/A Degree Extra	3 qt/A Degree Extra + 1 pt Atrazine + 3 oz Hornet + 1 pt 2,4-D
Previous Crop	Soybeans	Soybeans	Soybeans	Soybeans	Soybeans	Soybeans
Soil Test (P&K, PPM)	pH 7.0, P 17, K 204	m/d	pH 6.5, P 18, K 148	pH 7.0, P 44, K 90	pH 6.4, P 45, K 225	pH 6.7, P 25, K 135
Fertilizer	160-44-60	m/d	118-65-57	120-0-0	206-39-132	187-56-14
Residue After Planting	25%	m/d	m/d	m/d	54%	37%
Plot Design	Completely randomized - 4 replications	Completely randomized - 4 replications	Completely randomized - 3 replications	Alternating strips (6)	Completely randomized - 4 replications	Completely randomized - 3 replications

m/d = missing data

Methods

Six county locations were sites for a comparison of fall strip tillage to conventional tillage in corn production. Strip tillage was the use of a strip-till machine in the fall to build a berm upon which to plant corn the following spring. Conventional tillage was the use of a chisel plow in the fall, followed by a finishing tillage in the spring prior to planting the field. A completely randomized design was used at five of the six locations. Plot size varied by site. Sites were used as replications in the analysis of the data. All sites used a similar herbicide program. Previous crop was soybeans at all locations. In addition to yield, test weight, and moisture, attributes of the strip-tilled area (height of ridge, width of tilled area, and depth of the strip-tilled area) were also measured.

Results

Table 1. Corn Yield, Harvest Moisture, and Test Weight at Six Locations.

	Crawford	Hancock	Fayette	Morrow	Sandusky	Van Wert
Yield (bu/A)						
Conventional	80.4	85.4	141.8	58.1	185.9	99.5
Strip	77.3	81.2	149.1	45.9	182.5	97.9
F-test	F<1	LSD (0.05) NS				
Moisture (%)						
Conventional	19.5	15.2	18.1	21.3	18.6	15.0
Strip	19.3	15.6	18.7	21.1	18.5	15.0
F-test	F<1	LSD (0.05) NS				
Test Weight						
Conventional	56.5	57.0	m/d	m/d	58.9	m/d
Strip	56.8	56.4	m/d	m/d	59.2	m/d
F-test	F<1	LSD (0.05) NS				

Summary

1. Because of the wet spring in Ohio, followed by widespread drought and high temperatures during the summer, there was a wide range of planting dates and yields across the six locations.

2. Yields, moisture, and test weight were not statistically different for strip-tillage and conventionally tilled ground across all the sites.

3. Measurements taken in the fall (five sites) found an average strip tillage depth of 7.4 inches.

4. Width of strip-tilled zone at the surface averaged 11 inches (four sites).

5. Average height of strip-tilled berm in the fall was 3.4 inches. By planting time the strips had flattened and were very difficult to see and follow accurately with the planter. This indicates a need for deeper tillage to form higher berms.

6. Residue measurements were taken at three sites with the average in excess of 37% for strip tillage.

7. Strip-tillage may compete with harvest operations because it should be completed as soon as possible after soybean harvest.

8. There are differences in strip-till equipment.

9. Strip-till provides the environmental benefit of reduced erosion.

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Evaluation of Tillage Systems Following Soybeans for Field Corn

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Objectives

To compare population and yield of field corn under four different tillage systems following soybeans.

Background

Cooperator:	Marsh Foundation/ Farm Focus	Herbicides: PRE (May 25):	10 oz/A Epic + 2 qt/A Aatrex 4L + 1 pt/A 2,4-D LVE + 0.5 pt/A Banvel
County:	Van Wert		
Nearest Town:	Van Wert		
Soil Type:	Hoytville clay		
Drainage:	Systematic tile	Insecticide:	8 oz. per 1,000 row ft. Lorsban 15G T-banded
Previous Crop:	Soybeans		
Tillage:	Variable (see Methods)	Hybrid:	Beck's Hybrids 5322
Soil Test (2002):	pH 6.1, P 43 ppm K 124 ppm	Row Width:	30 inch
		Planting Rate:	30,500 seeds/A
Fertilizer:	250 lb/A 7-26-26 in row at planting 190 lb/A nitrogen sidedressed as NH3 on June 14, 2002	Planting Date:	May 24, 2002
		Harvest Date:	October 8, 2002

Methods

Four tillage systems were replicated four times in a randomized complete block design. The four tillage systems included no-till, fall strip-till, fall deep till followed by spring field cultivate, and a shallow fall disking. Strip-till was performed on November 15, 2001, by using a six-row 30-inch Trail Blazer strip-till machine 8 to 9 inches deep. The fall deep till/spring cultivate treatment consisted of using an M&W Earthmaster disk/ripper 16-inches deep on November 16, 2001, followed by a spring field cultivation three inches deep with two passes of a Wilrich C-shank field cultivator on May 24, 2002. The two-inch deep shallow disking treatment was performed on November 16, 2001, with an International #37 disk. The study was planted using a John Deere 7000 Max-emerge six-row planter. Each individual plot contained 12 rows and was 600 feet in length.

Percent residue was determined post-plant on May 30 by using a USDA-NRCS Crop Residue Management Kit. Early season populations (June 7, corn stage V2) and harvest populations (October 7) were estimated by counting the number of plants on each side

of a 17.5 feet tape at three different locations in each individual plot. The average of the number of plants counted per 17.5 feet was converted to plants per acre. Yields were collected from one combine round (12 rows). Individual plot weight and moisture was determined using a calibrated AgLeader PF3000 yield monitor in a John Deere 6620 combine. Yields reported in this study have been adjusted to 15% moisture standard.

Results

Table 1. Crop Residue, Population, Moisture, and Yield Means.[a]

Tillage Treatment	Crop Residue	Population at V2	Harvest Population	Grain Moisture	Yield
	(%)	(plants/A)	(plants/A)	(%)	(bu/A)
Fall deep till/spring cultivate	2.8 d	27,000 c	25,500	19.5 c	114.2 a
Strip-till	33.8 b	27,300 bc	25,500	20.0 b	101.7 b
Fall disk	24.5 c	28,500 a	26,000	19.8 bc	100.0 bc
No-till	42.0 a	28,100 ab	25,300	20.7 a	97.8 c
LSD (0.05)	4.5	1,000	NS	0.3	3.5
F-test	145.1	4.7	<1	24.5	45.6

[a] Means followed by the same letter in the same column are not significantly different.
NS = not significant

Summary

This is the second consecutive year for conducting this tillage trial at Farm Focus. Data from this year suggests that there were statistically significant yield differences among the tillage systems compared. Results from this study contradict similar work conducted in 2001 at Farm Focus that suggested no-till having a distinct yield advantage compared to the two conventional tillage applications. Possible reasons for lower yields in the reduced tillage and no-till plots in 2003 include heavier dandelion pressure in the plots with no spring tillage, and soil properties that may have been altered from intensive subsurface irrigation in past years. These soil properties may have had a greater effect in the plots where there was no deep tillage performed. Exact reasons for the lower yields are not known. Early population differences show weak significance among the tillage treatments; however, these population differences disappeared later in the season. This trial will be conducted at Farm Focus again in 2003 in order to obtain three years of data.

Acknowledgment

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Evaluation of Tillage Systems Following Wheat for Field Corn

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Objectives

To compare population and yield of field corn under three different tillage systems following wheat.

Background

Cooperator:	Marsh Foundation/ Farm Focus	Herbicides: PRE (April 27):	3 qt/A Fultime + 3 oz/A Hornet WDG + 1 pt/A 2,4-D LVE
County:	Van Wert		
Nearest Town:	Van Wert		
Soil Type:	Hoytville silty clay loam	Insecticide:	6.7 oz per 1,000 row ft. Aztec 2.1G T-banded
Drainage:	Tile		
Previous Crop:	Wheat	Hybrid:	Walton Hybrids WX1800A
Tillage:	Variable (see Methods)	Row Width:	30 inch
Soil Test (2002):	pH 6.4, P 48 ppm K 135 ppm	Planting Rate:	29,120 seeds/A
		Planting Date:	April 26, 2002
Fertilizer:	250 lb/A 7-26-26 in row at planting 180 lb/A nitrogen sidedressed as 28% UAN on June 8, 2002	Harvest Date:	October 7, 2002

Methods

Three tillage systems were replicated four times in a randomized complete block design. The three tillage systems included no-till, fall strip-till, and fall deep-till followed by spring field cultivation. Strip-till was performed on November 15, 2001, using a six-row 30-inch Trail Blazer strip-till machine 8 to 9 inches deep. The fall deep-till/spring cultivate treatment consisted of using an M&W Earthmaster #1150 disk/ripper 16 inches deep on November 15, 2001, followed by a spring field cultivation three inches deep with one pass of a Wilrich C-shank field cultivator on April 26, 2002. The study was planted using a John Deere 7000 Maxemerge six-row planter. Each individual plot contained 12 rows and was 1,090 feet in length.

Percent residue data collection was completed post-plant on May 10 by using a USDA-NRCS Crop Residue Management Kit. Early season populations (May 29, corn stage V3-V4) and harvest populations (October 3) were estimated by counting the number of

plants on each side of a 17.5 feet tape at three different locations in each individual plot. The average of the number of plants counted per 17.5 feet was converted to plants per acre. Yields were collected from one combine round (12 rows). Individual plot weight and moisture was determined using a calibrated PF3000 yield monitor in a John Deere 6620 combine. Yields reported in this study have been adjusted to 15% moisture standard.

Results

Table 1. Crop Residue, Population, Moisture, and Yield Means.[a]

Tillage Treatment	Crop Residue	Population at V3-V4	Harvest Population	Grain Moisture	Yield
	(%)	(plants/A)	(plants/A)	(%)	(bu/A)
No-till	57.8 a	23,700 b	23,700 a	18.3	103.8
Strip-till	46.0 b	24,600 a	22,200 b	18.2	103.1
Fall deep till/spring cultivate	2.3 c	24,700 a	23,500 a	18.0	99.9
LSD (0.05)	8.5	600	1,100	NS	NS
F-test	141.7	8.0	7.3	<1	2.2

[a] Means followed by the same letter in the same column are not significantly different.
NS = not significant

Summary

This is the second consecutive year for conducting this tillage trial at Farm Focus. Data from this year indicates that there were no statistically significant yield differences among the three treatments although no-till and strip-till were 4 and 3 bu/acre, respectively, above the deep-tilled plots. This agrees with the 2001 results and indicates that all tillage practices used in this study will provide similar yields following wheat. This held true for both years of the trial even though growing conditions were significantly different, resulting in much lower than normal yields in 2002. These yield results would also indicate that strip-till or no-till could be used following wheat to improve residue coverage without sacrificing corn yield.

Early populations under the no-till system were significantly lower than the strip-till or the conventional tillage populations. Corn emergence and growth were most likely slowed by cooler, wetter conditions under the no-till system. The slower, early season corn emergence did not have a negative effect on yield for the no-till management system. Again, this is consistent with results obtained from 2001. Significant differences in harvest populations among the three tillage systems are not expected and were most likely due to a series of environmental stresses experienced in 2002 such as frost, drought, and heat. These environmental stresses also most likely contributed to the overall stand reductions from the targeted seeding rates.

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A Word About Statistics

Dr. Phil E. Rzewnicki, Ohio State University On-Farm Research Coordinator

Why Statistics?

Statistics are used to assess the variability that is always present, and then make reasonable, mathematics-based guesses as to whether or not observed effects are due to chance or to treatments.

When we conclude that there is a reasonable chance that differences were, in fact, due to treatments, then we say treatments had a *significant effect*. This conclusion does not mean that we **proved** that the treatments caused differences, only that we are satisfied that our guess is probably correct.

When we are unable to draw the conclusion that treatments differed, we say that the treatments are *not significantly different.* This does **not** mean that treatments had no effect — it simply says that our research trial was not able to detect such an effect. There are two possibilities here — either the treatments really did not have an effect, or they did have an effect, but the experiment was not adequately designed to detect it.

Probability, Replication, and Randomization

If we declare two averages are "significantly different" at 5% probability level or $P = 0.05$, we are saying that we are willing to make a mistake one out of 20 times if, in fact, they are truly equal. The 5% probability level is the standard used for most field trials. However, 5% may be too conservative or overly cautious for some farmer-researchers. In some on-farm research trials, it may be decided that a wrong decision may not be very costly. This could be the case where treatment costs are essentially the same, e.g., seed costs in variety comparisons. It may be decided to use a probability level of 10% if one is willing to make a mistake one out of 10 times, or 20% for a risk of one out of five.

Selecting the probability level is a "decision rule." Increasing the sample size or replicates reduces the chances of making an incorrect decision when the same decision rule is applied.

In on-farm research trials, experience has shown that five to six replicates are usually needed to detect meaningful and real differences between treatments if they exist. Each treatment is represented at least once within each replicate. Replications may be located adjacent to each other within a single field or located in separate fields or farms.

Randomization of treatments within a replicate is important to avoid biased location of treatments. Having treatments in the same order in replicates across a field may cause bias due to soil fertility trends or soil moisture trends stretching across the field.

The F-Test and Least Significant Difference

A test for significance for differences between or among treatment means is the

F-test. It is the ratio of the variation due to treatments divided by the variation of individual samples. Values close to one indicate there is little or no variation due to treatments. Values much larger than one indicate that variation due to treatments is larger than expected by chance alone.

If an F value for a trial is found to be significant and there are more than two treatments being analyzed, then further testing requires calculating another test for significance called the Least Significant Difference (LSD). The LSD helps to detect which pairs of treatment means are significantly different from each other. When a trial contains more than two treatments, it is sound statistical protocol to conduct an F-test before pairwise comparisons are made with LSD. This procedure is referred to as *Fisher's (protected) LSD.*

Using LSD alone can lead to increasing error in making comparisons since the likelihood of declaring significant differences between any two treatments increases as more than two comparisons are made. If a trial contains only two treatments, then using an F-test to find significance is equivalent to using LSD alone.

For most trials in this report, an F-statistic was calculated first. If treatments were found to be significantly different, then LSD is sometimes reported in lieu of the F value.

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